e-Front runners

FUJI ELECTRIC

AS-INTERFACE
LIMIT SWITCHES
PROXIMITY SWITCHES
PHOTOELECTRIC SWITCHES

INDIVIDUAL CATALOG

from D&C CATALOG 19th Edition Revised

05

AS-i gateway

Limit switches

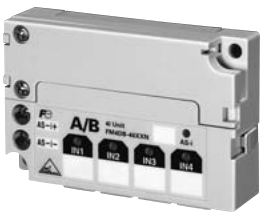
AS-i cables

Proximity switches

Analog slaves

Proximity switches

A/B slaves



Photoelectric switches

7-segment display

LOW VOLTAGE EQUIPMENT
Up to 600 Volts

D & C CATALOG DIGEST INDEX

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02	DUO series Manual Motor Starters and Contactors Combination Starters
03	Industrial Relays, Industrial Control Relays Annunciator Relay Unit, Time Delay Relays Electronic Counters
04	Pushbuttons, Selector Switches, Pilot Lights Rotary Switches, Cam Type Selector Switches Panel Switches, Terminal Blocks, Testing Terminals
05	AS-Interface, Limit Switches Proximity Switches Photoelectric Switches
06	Molded Case Circuit Breakers
07	Earth Leakage Circuit Breakers Earth Leakage Protective Relays
08	Circuit Protectors Low Voltage Current-Limiting Fuses Air Circuit Breakers
09	Measuring Instruments, Arresters, Transducers Power Factor Controllers Power Monitoring Equipment (F-MPC)
10	AC Power Regulators Noise Suppression Filters Control Power Transformers
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05 As-Interface Limit switches, Proximity switches Photoelectric switches

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MINIMUM ORDERS
Orders amounting to **less than ¥10,000** net per order will be charged as ¥10,000 net per order plus freight and other charges.

WEIGHTS AND DIMENSIONS
Weights and dimensions appearing in this catalog are the best information available at the time of going to press. FUJI ELECTRIC FA has a policy of continuous product improvement, and design changes may make this information out of date.
Please confirm such details before planning actual construction.

INFORMATION IN THIS CATALOG IS SUBJECT TO CHANGE WITHOUT NOTICE.

AS-Interface

■ Description

The Actuator-Sensor-Interface (AS-i) bus system is a two-core serial wiring system that can transfer data and supply power to modules and sensors simultaneously. This system is an open and standardized network positioned at the lowest level of an FA network system. AS-i conforms to EN 50295, which covers sensors and actuators from all major manufacturers.
Using a standardized AS-i cable enables many manufacturers' sensors and actuators to be connected freely and reliably, with less wiring and superior environmental resistance.

■ **The simplest automation solution as the industrial standard**

Power supply

AS-i power supply: IP20
FP1AA-JNW072

AS-i communications cable

External power supply
24V DC

MICREX-SX series: IP30
NP1L-AS2

FLEX-PC NJ series: IP30
NJ-ASL

Module inside control panel

Terminal block type slave: IP20

FM1D-22□□P

2-input/2-output

FM2D1-04RQX

4-output

Module outside control panel

Flat waterproof slave: IP67

FM6D□1-40XX□
(mounting plate: FM6B□-04FK)

4-input

FM6D1-22T□□
(mounting plate: FM6B□-04FE)

2-input/2-output

FM6D1-04T□X
FM6DB1-03T□X
(mounting plate: FM6B□-04FE)

4-output
3-output

FM6A□□-□□
(mounting plate: FM6B□-04FE)

Current IN/OUT
Voltage IN/OUT
Res. bulb input

External power cable
or equivalent

AS-i communications cable

Slim waterproof slave: IP67

FM6D2-40XX□

4-input

FM6D2-22T□□

2-input/2-output

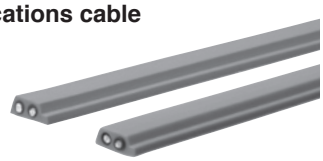
FM6D2-04T□X

4-output

AS-i cables

Two-core cables are used to connect devices. One AS-i communications cable supplies power and transfers data.

AS-i communications cable
FX3CAEY
FX3CATY
3RX9010-0AA00
3RX9013-0AA00
3RX9015-0AA00

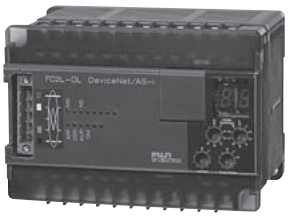


External power cable
FX3CAEB
FX3CATB
3RX9020-0AA00
3RX9023-0AA00
3RX9025-0AA00

Master

FLEX-PC NB6: IP20
NB6P26T-14

DeviceNet/AS-i gateway: IP20
FC2LA-DL



T-link/AS-i gateway: IP20
FC2L-TL

Module inside control panel

Repeater: IP67
FX9R031

Flat dustproof slave: IP20

FM4D□-40XX□

4-input

FM4D-22TN□□

2-input/2-output

FM4D-04TNX
FM4DB-03TNX

4-output
3-output

AS-i power supply: IP20
FP1AA-JNW072

Slim dustproof slave: IP40
FM4D1□-40XXN

4-input

FM4D1-04TXN
FM4DB1-03TNX

4-output
3-output

Digital picking slave
FM4DP□-□□1□

Inverter bulit-in AS-i slave
FRN□□□C1S-□AJ

AS-i motor starter slave: IP65
FE16D-SJ13RG□E12□□■

External power cable or equivalent

External power supply
24V DC

Addressing tool

Used to set slave addresses

Addressing unit
FL1HA-E

■ Connects to up to 62 slaves

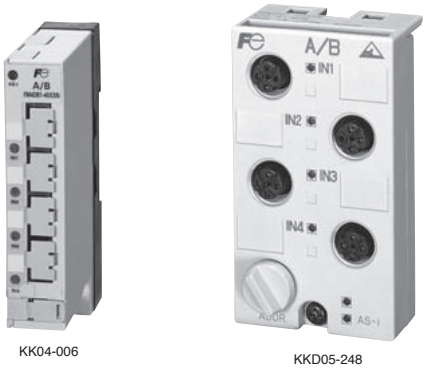
- Connects to up to 62 slaves provided with an ID code A (called A/B slaves here) compatible with AS-interface version 2.1.
- Conventional addresses 1 to 31 added with sub address A or B are assigned to the A/B slaves.
- Addresses 1A to 31A, and 1B to 31B are used.
- An A/B slave uses one of the output data bits of the PLC to select sub address A or B. Therefore, each slave has a maximum of four input points and three output points.
- A slaves (slaves with sub address A) are processed at the first cycle and B slaves (slaves with sub address B) are processed at the second cycle.
  Therefore, the required cycle time is approximately 10ms, which is twice as long as the conventional cycle time.
- If there is only a single A slave or B slave connected at an address, the slave will be processed each cycle.

■ Connects to analog slaves

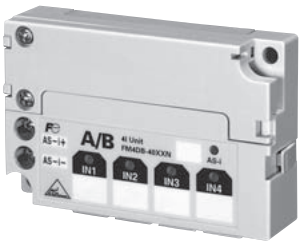
- Analog slaves with an S7.3 or S7.4 slave profile compatible with AS-interface version 2.1 can be connected automatically.
- A single master connects to up to 31 analog slaves.
- Data for each channel is transmitted in seven blocks.

■ Peripheral error function added

- This new function enables the AS-i/FAULT indicator of the slave to display internal slave errors. The errors are reported to the master as well.
- Reported error data varies with the specifications of the slave. (This function supports only analog slaves.)
  This function makes it possible to display the supply status of an auxiliary power supply and the conditions of I/O devices, such as short-circuiting or disconnection of the I/O device. (This function supports only analog slaves.)


KK04-006

KKD05-248



KK04-005

HK104-004

■ Compatibility of Ver 2.1 and Ver 2.0 masters and slaves

	Ver.2.1 master		Ver.2.0 master	
	Connection	No.of Connectable slaves	Connection	No.of Connectable slaves
Standard slave	Yes	31	Yes	31
A/B slave	Yes	62	Yes*	31
Analog slave	Yes	31	—	0
Safety slave	Yes	31	Yes	31

* Applicable if settings are made to use A slaves only.

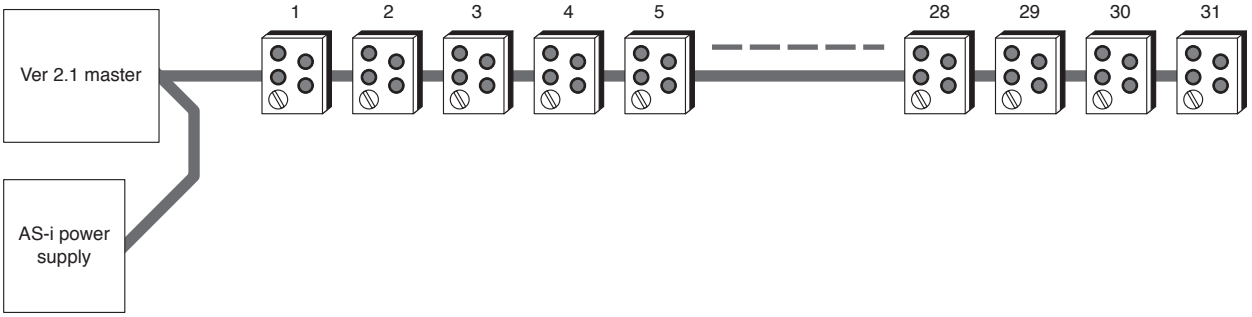
■ Main specifications

	Ver.2.1	Ver.2.0
Number of connectable slaves	62	31
Number of I/O points	434 points max. (248 input points and 186 output points) with A/B slaves used. *1	248 points max. (124 input points and 124 output points) with standard slaves used. *2
Topology	Tree, line, and star	
Max. cable length	100m max. (300m using repeater, 600 using Extention Plug)	
Transmission media	AS-i cable or parallel cables (2 x 1.5mm2)	
Max. cycle time	Approximately 5ms: With 31 standard slaves used. Approximately 10ms: With 62 A/B slaves used.	Approximately 5ms: With 31 standard slaves used.

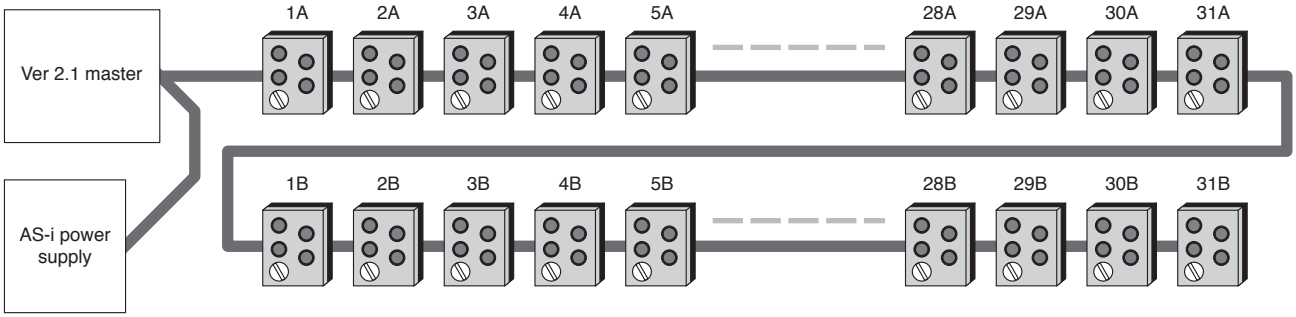
Note *1 Up to 62 A/B slaves are connectable. When each slave uses four input and three output points, up to 434 points are available.
*2 Up to 31 standard slaves are connectable. When each slave uses four input and four output points, up to 248 points are available.

■ Configuration examples

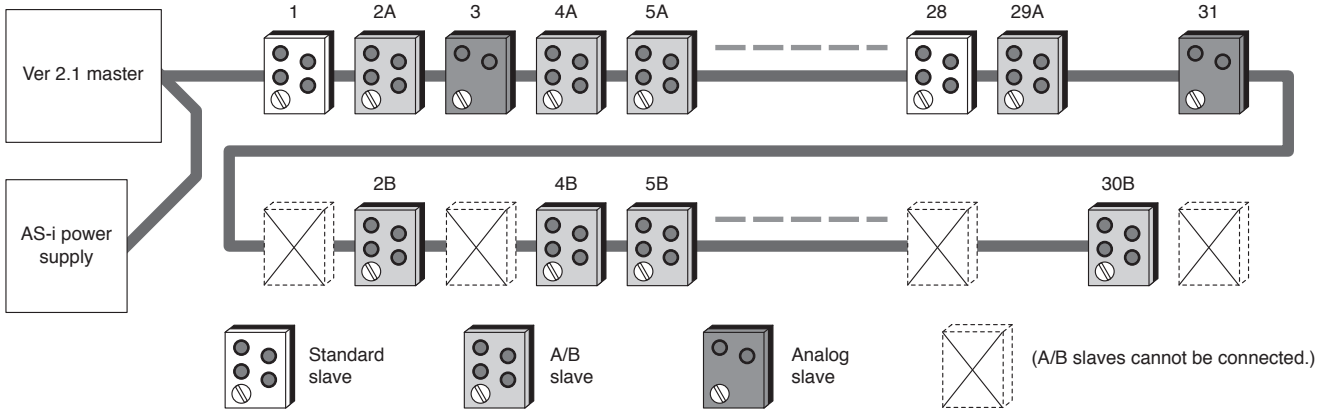
Example 1: 31 standard slaves



Example 2: 62 A/B slaves



Example 3: Standard slaves, A/B slaves, and analog slaves used together



* The above illustration shows the allocation of slaves for easy reference. Actual connections do not require allocation in address order.

■ Communication cycle

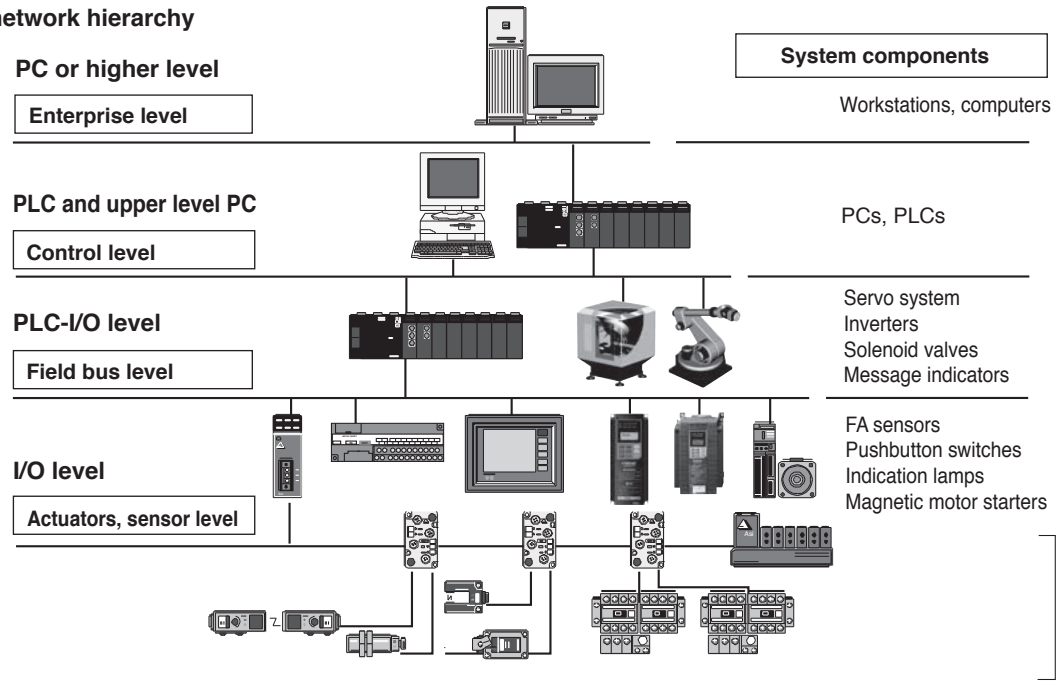
As shown in example 1, where only standard slaves are used, the slaves are refreshed every cycle. The required cycle time is approximately 5ms.

As shown in example 2, where only A/B slaves are used, the A slaves are refreshed at the first cycle and the B slaves are refreshed at the second cycle. The required cycle time is approximately 10ms.

As shown in example 3, where three types of slaves are used together, the standard slaves and the A/B slaves not in pairs are refreshed every cycle. The required cycle time is approximately 5ms. As for the A/B slaves in pairs, the A slaves are refreshed at the first cycle and the B slaves are refreshed at the second cycle. The required cycle time is approximately 10ms.

Seven cycles are required to refresh the data of a single channel of the analog slaves. The required cycle time is approximately 70ms for two channels.

■ FA network hierarchy



■ Superior open network

AS-i is an open network that is supported worldwide because it conforms to various international standards.

- A wide variety of peripheral devices can be used irrespective of vendors of PLC or higher level.
- Various devices may be procured from all over the world through a multivendor system. This simplifies procurement.

- AS-International Association: Established in 1991
- Japan AS-i Association: Established in 2001

Conforms to IEC 62026-2, EN 50295, EMC Directive
Conforms to GB/T 18858.2 (The AS-i is not subject to CCC.)
(The AS-i is not subject to UL standard because 30V DC or less is applied to it.)

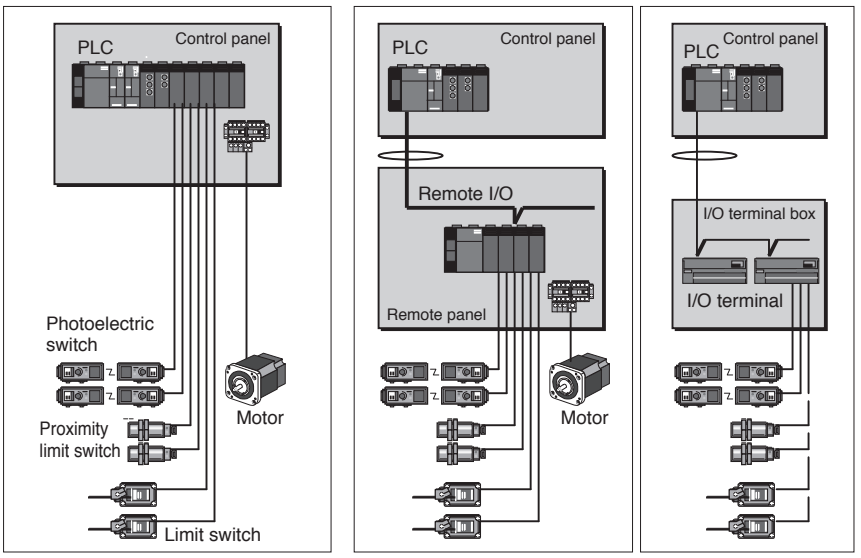
Self-certified

Certified by a third party

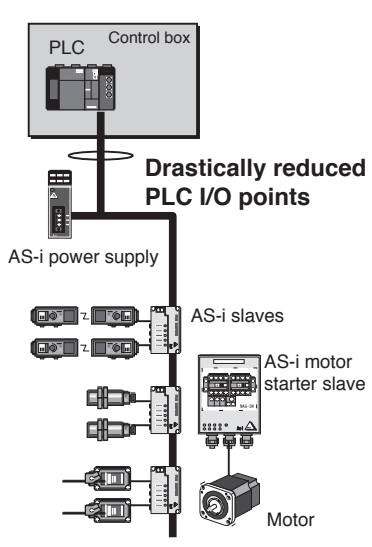
■ Wiring

Introduction of AS-i simplifies conventional wiring and does not require remote I/O and I/O terminal installation. The increase in cable and wiring cost normally required each time the system is upgraded, can thus be reduced.

Conventional centralized wiring, remote I/O and I/O terminal system



Reduced-wiring AS-i system

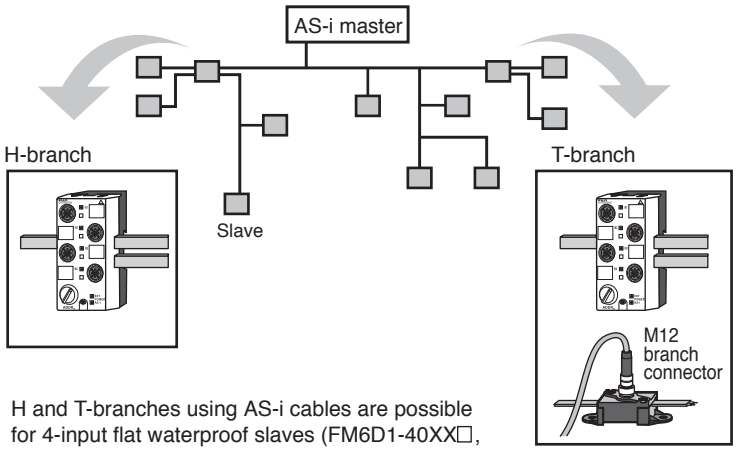


Greater cost savings by reducing wiring

■ Flexible wiring method

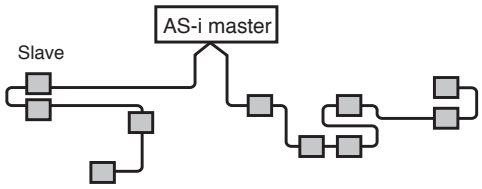
AS-i enables highly flexible wiring. Three kinds of network topology, tree, line, and star, are available. Conventional wiring and cable quantities can be greatly reduced.
No terminating resistors are required.

• Tree structure

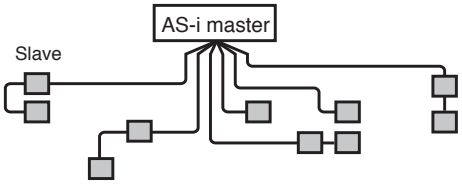


H and T-branches using AS-i cables are possible for 4-input flat waterproof slaves (FM6D1-40XX□, FM6DB1-40XX□).

• Line structure

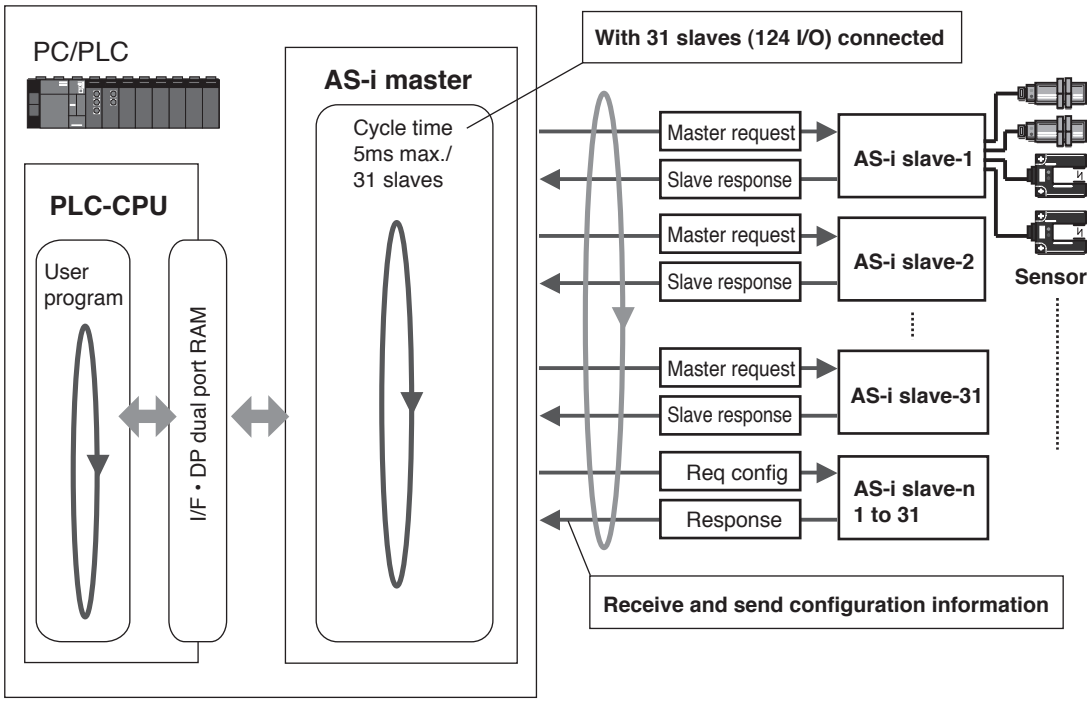


• Star structure



■ High-speed response

- The data transmission time (cycle time) is approx. 5ms. when connecting 31 slaves, 10ms when connecting 62 slaves.
- Self diagnosis is performed simultaneously on slave configuration information.

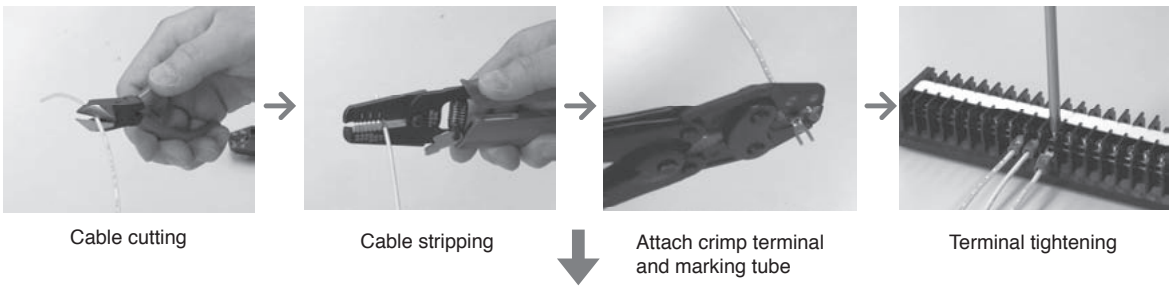


■ Reduced installation and wiring time

A single AS-i cable (2-core) can send data and supply power. Waterproof-type slaves and AS-i cables can be easily connected by tightening a screw on the actual slave, using piercing technology.

- The asymmetrical cross-section of the AS-i cable facilitates polarity confirmation and prevents connection error.
- After a slave is removed, the pin holes are blocked by the elasticity of the cable to recover insulation.

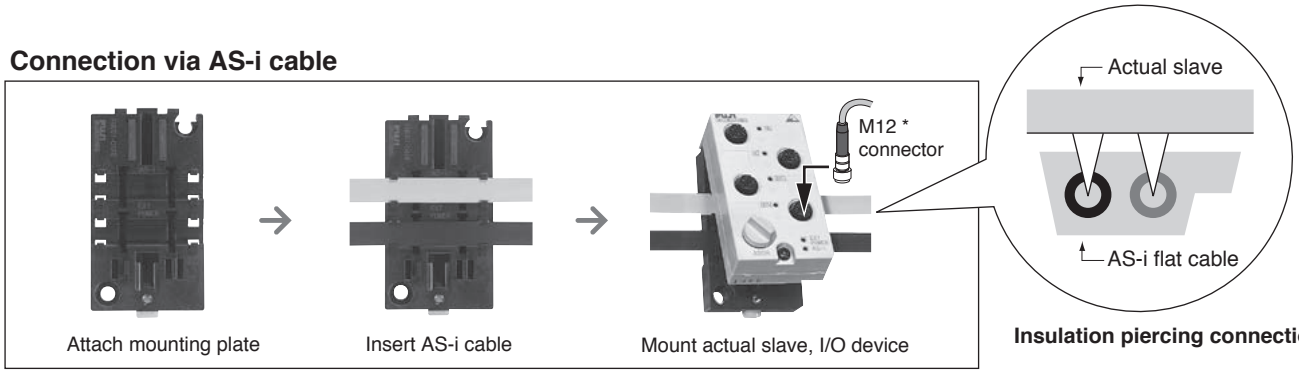
Conventional method



Cable cutting → Cable stripping → Attach crimp terminal and marking tube → Terminal tightening

*The actuators and sensors (I/O devices) are connected to slaves via connectors by snapping action. This helps reduce man-hour and prevent connection error.

Connection via AS-i cable

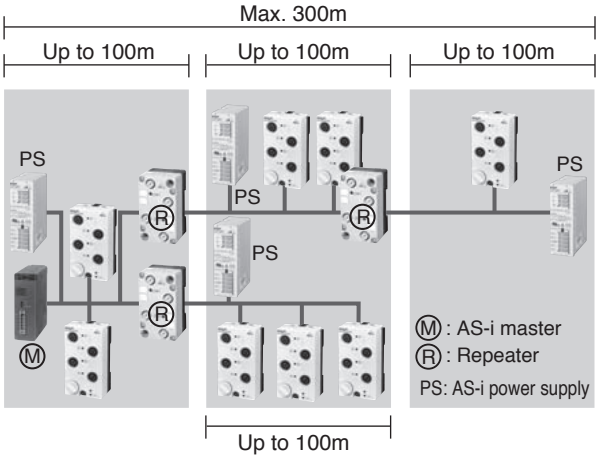


Attach mounting plate → Insert AS-i cable → Mount actual slave, I/O device

Insulation piercing connection

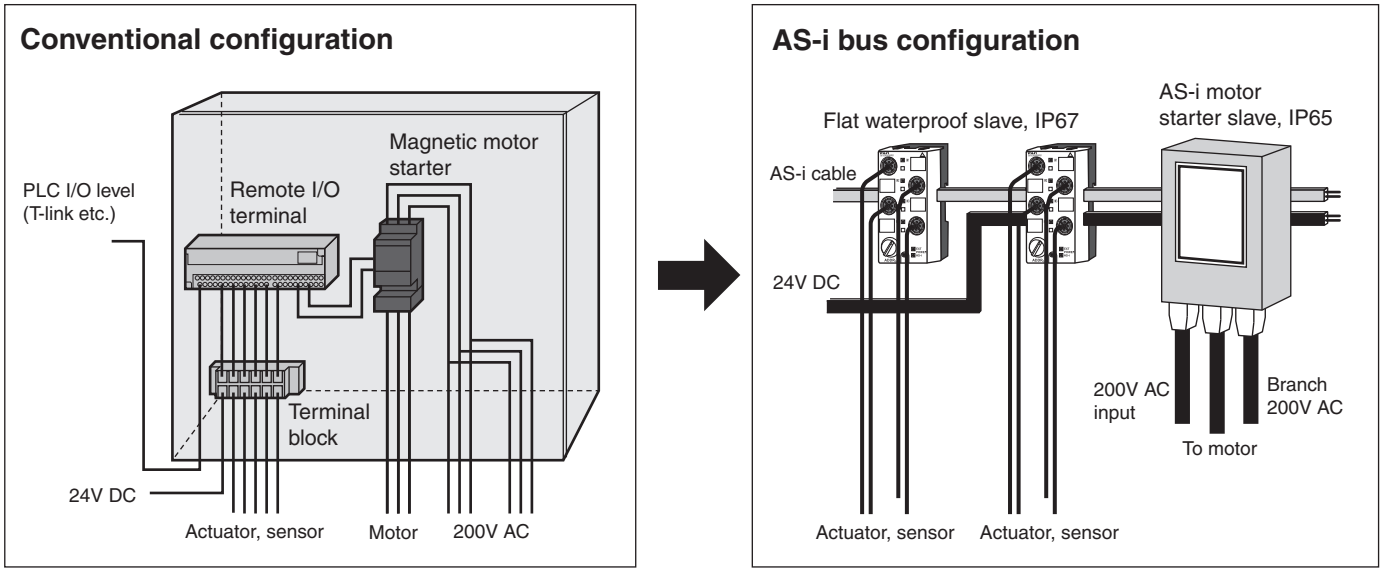
■ Superior communications

- The standard transmission distance of 100m can be extended to up to 300m using repeaters.
- AS-i features a rapid cycle time of approx. 5ms when connecting 31 standard slaves, and 5ms when connecting 62 A/B slaves.
- In AS-i system of version 2.1, up to 434 I/O signals (62 slaves) for sensors and actuators can be sent on 2-core serial wiring.
- In protected mode, the address of a failed slave is indicated on a master (except NB6). After the slave is replaced, the automatic addressing function automatically assigns the original address to the new slave (when replacing only one slave).



■ Superior environmental resistance

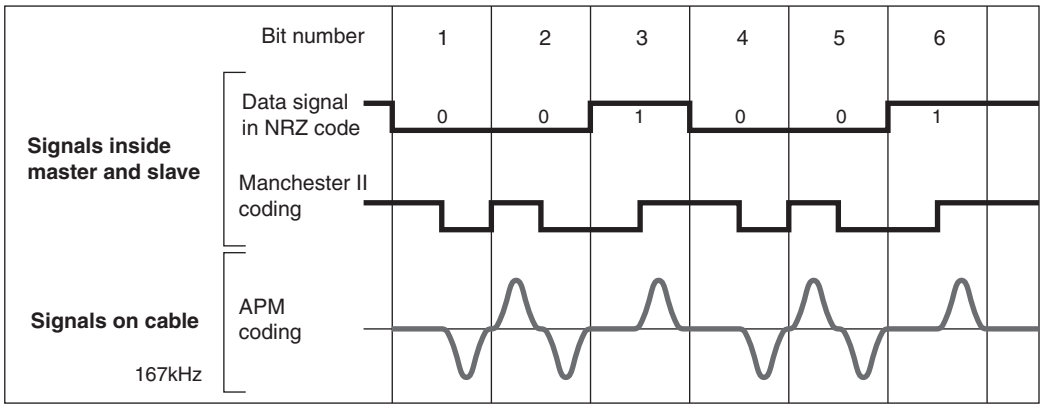
Slaves now have outstanding environmental resistance (IP65, 67). This reduces the number of relay boxes required and contributes to downsizing.



Conveiance line application example

■ Excellent noise immunity

Transmission signals employing a sin2 waveform have superior noise immunity.



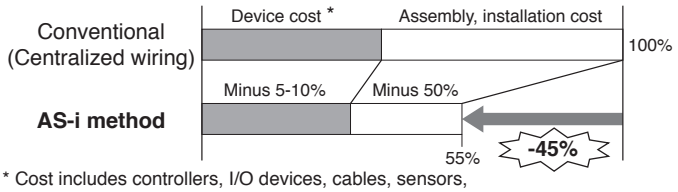
In AS-i, data signals are first encoded in Manchester II code, and are then sent out on AS-i cable in sin^2 waveform using alternating pulse modulation (APM). APM has the following advantages.

• Emission
As the sin2 waveform has a narrow spectrum bandwidth, noise radiated from AS-i cables does not affect other devices

• Immunity
As APM has good regularity and redundancy, very effective error detection is possible to ensure highly reliable data.

■ Cost savings with AS-i

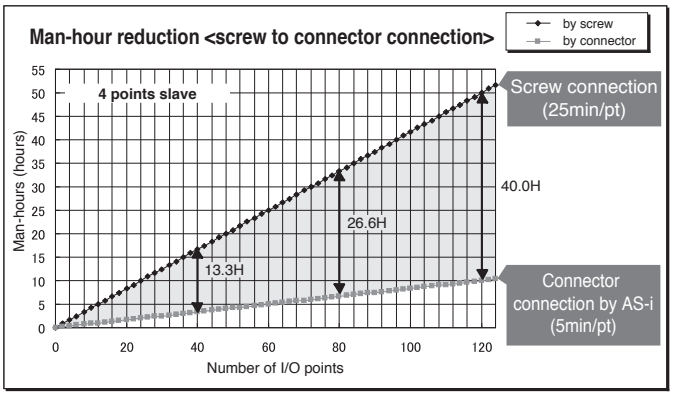
Example of a conveyance line



* Cost includes controllers, I/O devices, cables, sensors, relay boxes, etc.

The figure on the left is an example of the cost savings for one of our customers. On average, about 30% can be saved with most equipment by introducing AS-i. Though the cost of introducing AS-i devices may be higher, most 15% to 30% savings can be expected in most cases.

■ Man-hour savings



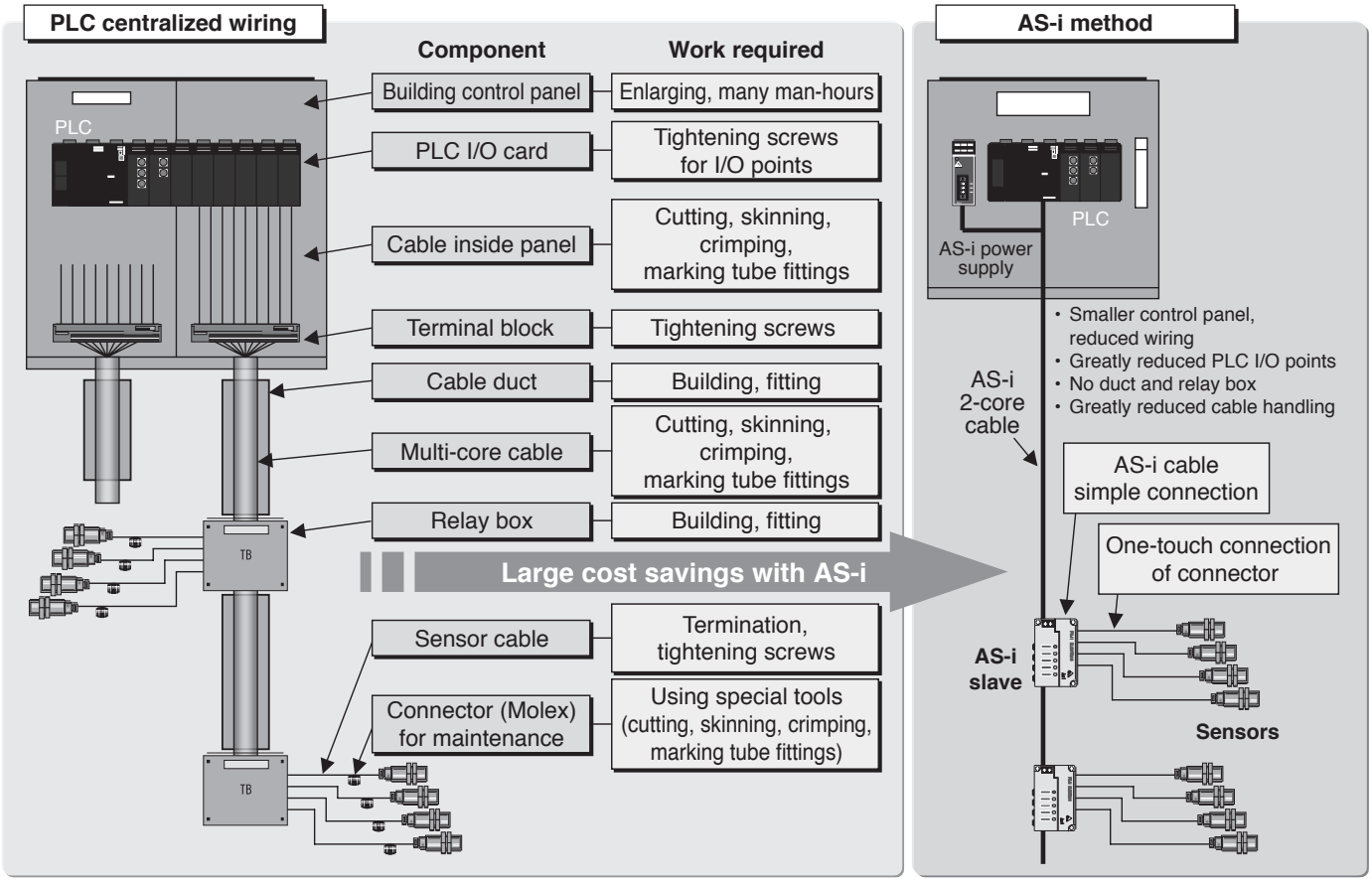
The more I/O points and the higher the pay, the greater the cost savings.

The figure on the left is an example of lower man-hours for one of our customers. The man-hours include the following:

1. Measuring cable length (tape measure)
2. Cutting cable (nipper)
3. Skinning sheath (wire stripper)
4. Attaching crimp terminal (crimping tool)
5. Connecting cable to terminal (screwdriver)
6. Checking connections

* Tools in parentheses for each task are not required for AS-i connector connection.

■ Smaller control panel

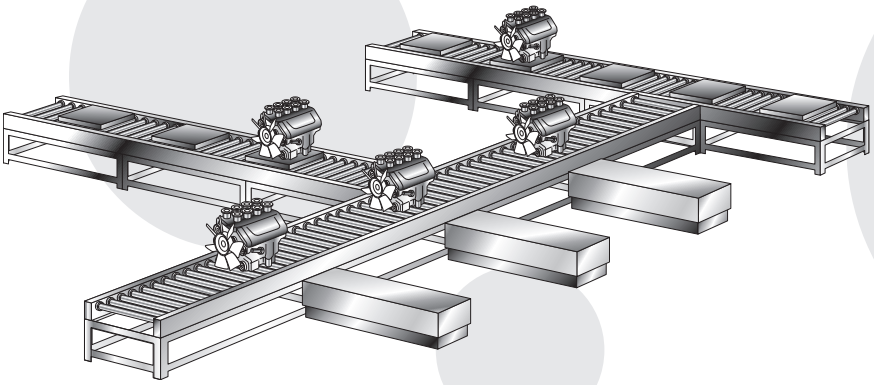


■ Applications

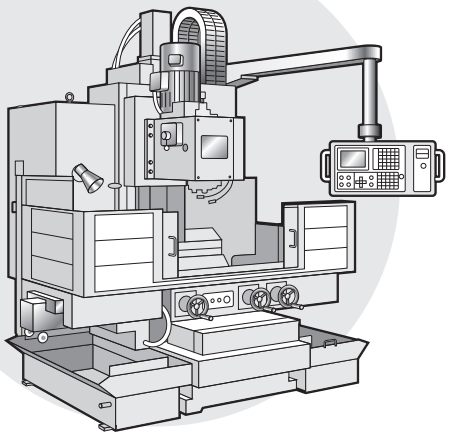
The above-mentioned conventional machines are equipped with numerous I/O devices and complex cabling from the control panels, making it difficult to reduce the lead time required for the facility, downsize the control panels, flexibly adopt to changes on the lines, and/or to locate and quickly restore failures. Under AS-i, however, the mounting of slaves with high environmental resistance outside the panel enables the elimination of terminals inside the control panel, leading to dramatically smaller control panels.

By employing a wiring system without restriction, not only can the cable volume be significantly reduced, but so can the time required for starting up the facility coupled with greater flexibility in responding to changes on the lines. In addition, the excellent fault diagnostics afforded by AS-i enables you to pinpoint and quickly restore failures.

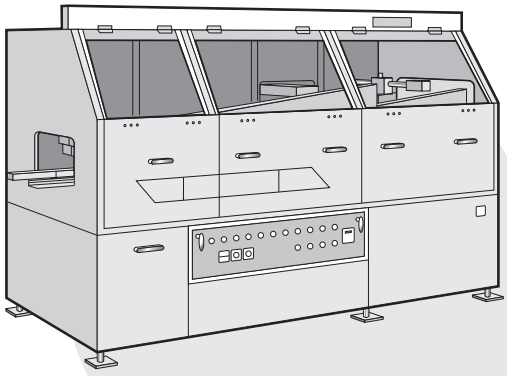
1. Automotive manufacturing equipment



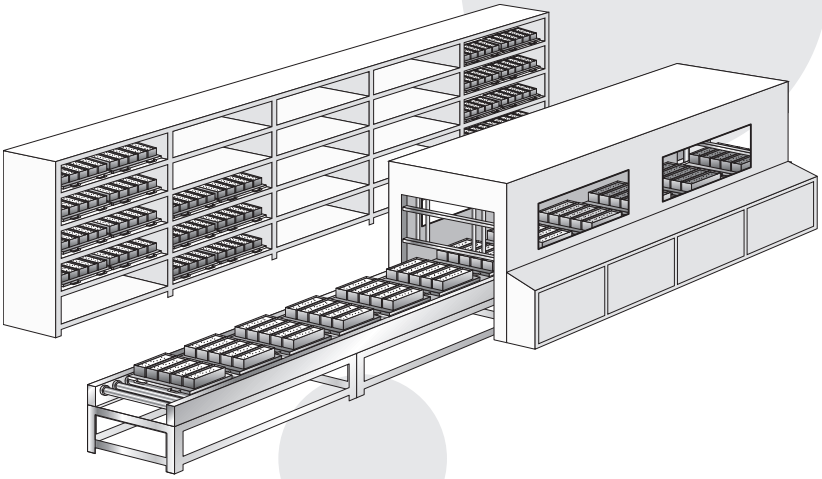
2. Machine tools



3. Semiconductor manufacturing equipment

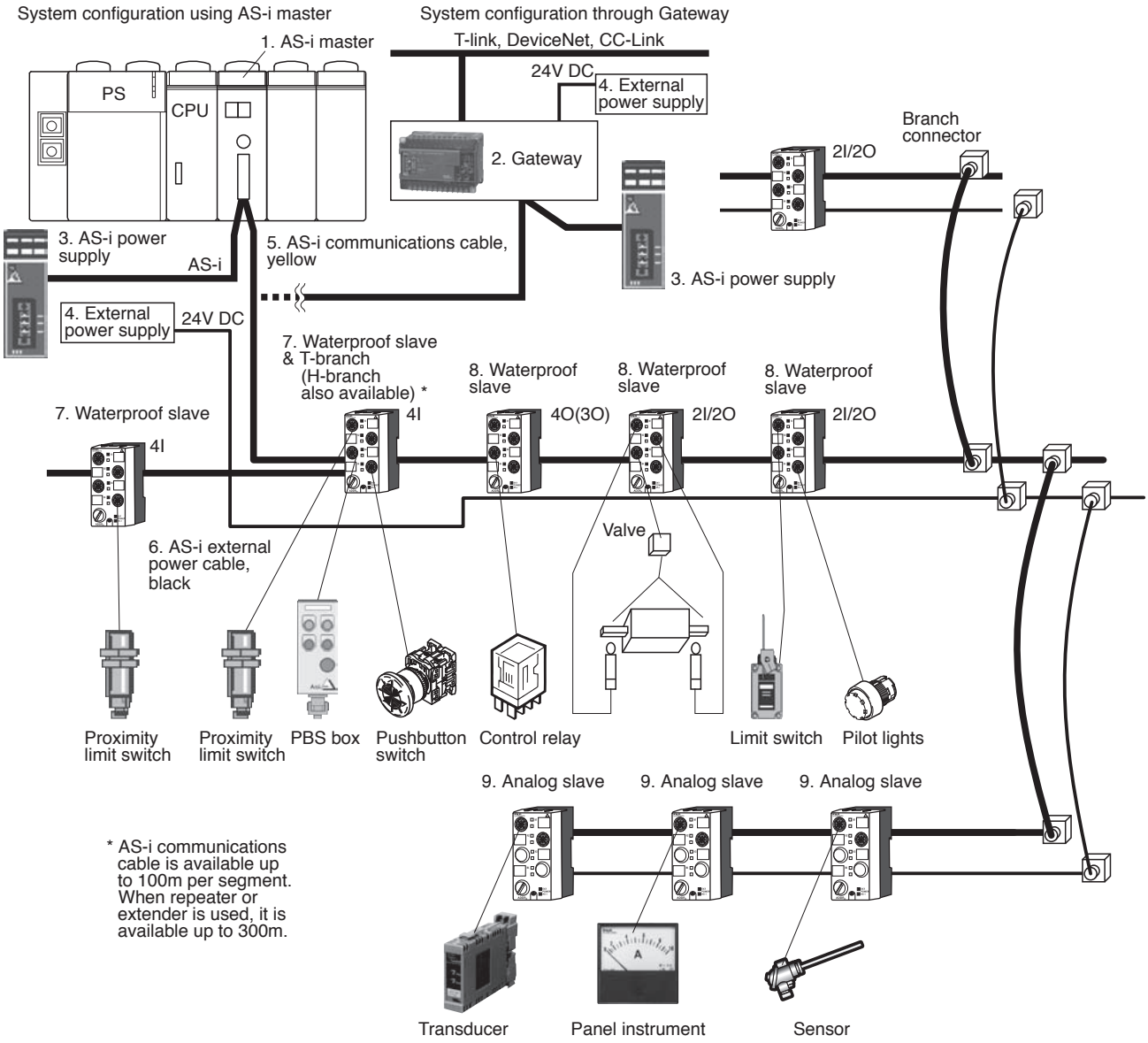


4. Food manufacturing equipment



System configuration

■ System configuration using waterproof slaves



■ Devices required for system configuration

Device	Device No.	When using AS-i master		When using Gateway		See page(s)	Remarks
		Input only	Input/ Output	Input only	Input/ Output		
AS-i master	1	○	○	—	—	29-34	Max.31 standard and analog slaves
Gateway	2	—	—	○	○	35-38	Max.62 A/B slaves
AS-i power supply	3	○	○	○	○	82	One unit is required per one segment.
External power supply, 24V DC	4	—	○	○	○	—	—
AS-i communications cable, yellow	5	○	○	○	○	28	Up to 100m per segment
AS-i external power cable, black	6	—	○	—	○	28	—
Slave (4I)	7	○	○	○	○	39-80	
Slave (2I/2O, 3O, 4O)	8	—	○	—	○		
Analog slave	9	○	○	○	○	53-56	
Addressing unit	—	○	○	○	○	86-88	Addressing cable is required.
Others						89	To the unused sockets of waterproof slaves, fit waterproof caps.

■ Protection of AS-i cable

- As the insulation voltage of AS-i cable sheath is 1500V, mechanical and electrical protective measures such as conduit pipes or ducts are not necessary, unless mechanical damage is anticipated to the cable.
- Shielding and grounding to the cable are not required. No terminating resistors are required.

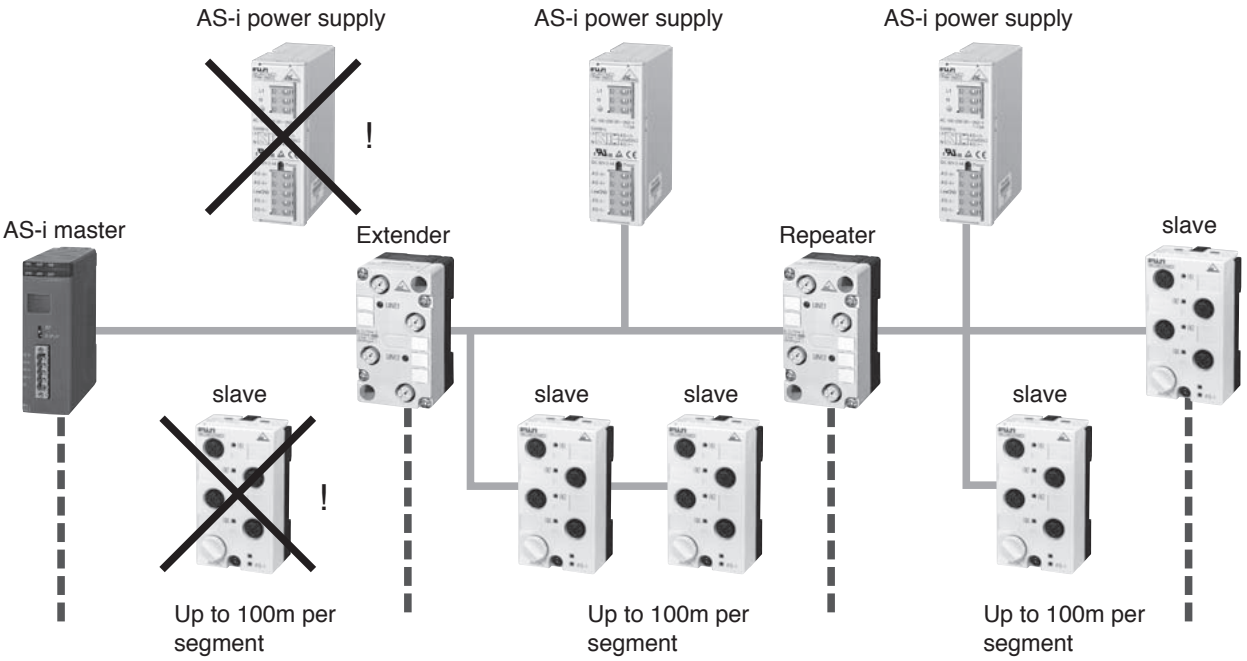
■ Measures against noise

- To prevent inductive noise, AS-i cables and sensor cables should be wired as far as from high-voltage cables and power lines. 100mm on above is recommended. Attach a surge suppressor to a device that could generate noise.

For details of this product, see User's Manual No.FEH705.

■ Concept of segment

The following shows a configuration example that uses extenders and repeaters.



Max. 31 standard and analog slaves (or Max. 62 A/B slaves)

■ AS-Interface master

Type		NP1L-AS2	NP1L-AS1	NJ-ASL
AS-i version		V2.1 AF00-196	V2.0 AF00-112	V2.0 AF99-95
Series		MICREX-SX series	MICREX-SX series	FLEX-PC NJ series
No. of slots occupied		1	1	1
AS-i specification	Max. connectable slaves	A/B slave : 62 Standard slave : 31	31	31
	Max. No. of input/output points	A/B slave : 434 *2 Standard slave : 248 *1	248 *1	248 *1
Degree of protection (IEC 60529)		IP30	IP30	IP30 (excluding terminal section)
Mounting method	IEC rail/screw dual mounting	Yes (base unit required)	Yes (base unit required)	—
	Rail mounting only	—	—	—
	Screw mounting only	—	—	Yes (base unit required)
Mass		Approx. 180g	Approx. 180g	Approx. 230g
Approval		CE	CE	—
Refer to		Page 05/29	Page 05/31	Page 05/32

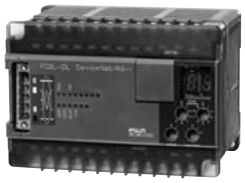
Notes: *1 Max. 124 input points, max.124 output points
*2 Max. 248 input points, max.186 output points

■ AS-i conformed PLC

Type		NB6P26T-14
AS-i version		V2.0 AF99-92
Series		FLEX-PC NB6 series
Input/output specifications		Input: 24V DC, 16 points Output: Transistor, 10 points
AS-i specification	Max. connectable slaves	31
	Max. No. of input/output points	248 *1
Degree of protection (IEC 60529)		IP20
Mounting method	IEC rail/screw dual mounting	Yes
	Rail mounting only	—
	Screw mounting only	—
Mass		Approx. 1kg
Approval		—
Refer to		Page 05/33

Notes: *1 Max. 124 input points, max.124 output points

■ Gateway

Type		DeviceNet/AS-i gateway	T-link/AS-i gateway
AS-i version		**FC2LA-DL** V2.1	**FC2L-TL** V2.0
		 AF00-14	 KK01-298A
Upper level network	Network name	DeviceNet	T-link
	Transmission speed/distance	125bps/500m, 250kbps/250m 500kbps/100m	500kbps/1000m
	Station number setting	64 stations with numbers from 01 to 63, but no overlaps of number	0 to 99
AS-Interface	Max. connectable slaves	A/B slave : 62 Standard : 31	31 per gateway
	Max. No. of input/output points	A/B slave : 434 *2 Standard : 248 *1	248 *1
Input power specifications	Supply voltage	24V DC	24V DC
	Power consumption	Max. 3.3W	Max. 3.3W
Degree of protection (IEC 60529)		IP20	IP20
Mounting method	IEC rail/screw dual mounting	Yes	Yes
	Rail mounting only	—	—
	Screw mounting only	—	—
Mass		Approx. 320g	Approx. 320g
Approval		CE	—
Refer to		Page 05/35	Page 05/37

Notes: *1 Max. 124 input points, max.124 output points
*2 Max. 248 input points, max.186 output points

■ AS-i power supply

Type		AS-i communication **FP1AA-JNW072**
		 KK01-242A
Input	Rated voltage	100 to 230V AC
	Allowable voltage range	85 to 253V AC
	Rated frequency	50/60Hz (47 to 63Hz)
Output	Type of output	Output 1 (for communications)
	Rated voltage	30V DC
	Output power	2W
	Output current (current range)	2.4A (0 to 2.4A)
Operating temperature		–10 to +55˚C
Degree of protection (IEC 60529)		IP20
Mounting method	IEC rail/screw dual mounting	—
	Rail mounting only	Yes
	Screw mounting only	—
Mass		Approx. 700g
Approval		CE, UL, cUL
Refer to		Page 05/82

■ Slave

Kind of slave		Flat waterproof slave			
Slave type		Standard slave			A/B slave
Type		**FM6D1-40XX** □ *1 **FM6D1-40XX** □ **CM** *1	**FM6D1-04T** □ **X** *1	**FM6D1-22T** □□ *1	**FM6DB1-40XX** □ *1
		KKD05-248	KKD05-242	AF01-75	KKD05-246
Input/output		4I (NPN, PNP)	4O (NPN, PNP)	2I/2O (NPN, PNP)	4I (NPN, PNP)
Current consumption (including sensors)		245mA DC or less	45mA DC or less	245mA DC or less	245mA DC or less
Sensor power supply	Sensor voltage range	20 to 27V (I ≦ 160mA) 18 to 27V (I ≦ 200mA)	—	20 to 27V (I ≦ 160mA) 18 to 27V (I ≦ 200mA)	20 to 27V (I ≦ 160mA) 18 to 27V (I ≦ 200mA)
	Current carrying capacity	200mA (Ta ≦ 25˚C) 160mA (Ta = 45˚C) 80mA (Ta = 80˚C)	—	200mA (Ta ≦ 25˚C) 160mA (Ta = 45˚C) 80mA (Ta = 80˚C)	200mA (Ta ≦ 25˚C) 160mA (Ta = 45˚C) 130mA (Ta = 60˚C)
Output (per point)	External power supply	—	24V DC	24V DC	—
	Type of output	—	NPN, PNP	NPN, PNP	—
	Current carrying capacity, typical	—	1A	1A	—
Applicable I/O connector		M12 connector (IEC 60947-5-2) See page 91			
Degree of protection (IEC 60529)		IP67 (with M12 connectors, mounting plate and cable)			
Mounting method	Rail	Yes	Yes	Yes	Yes
	Screw	Yes	Yes	Yes	Yes
Mass		Approx. 115g (mounting plate: Approx. 35g included)			
Approval		CE	CE	CE	CE
Refer to		Page 05/40	Page 05/40	Page 05/40	Page 05/41

Kind of slave		Flat waterproof slave	Slim waterproof slave		
Slave type		A/B slave	Standard slave		
Type		**FM6DB1-03T** □ **X** *1	**FM6D2-40XX** □ *1	**FM6D2-04T** □ **X** *1	**FM6D2-22T** □□ *1
		KKD05-246	AF01-81	AF01-80	AF01-82
Input/output		3O (NPN, PNP)	4I (NPN, PNP)	4O (NPN, PNP)	2I/2O (NPN, PNP)
Current consumption (including sensors)		45mA DC or less	205mA DC or less	45mA DC or less	205mA DC or less
Sensor power supply	Sensor voltage range	—	20 to 27V (I ≦ 160mA)	—	20 to 27V (I ≦ 160mA)
	Current carrying capacity	—	160mA (Ta ≦ 25˚C) 130mA (Ta = 40˚C) 70mA (Ta = 70˚C)	—	160mA (Ta ≦ 25˚C) 130mA (Ta = 40˚C) 70mA (Ta = 70˚C)
Output (per point)	External power supply	24V DC	—	24V DC	24V DC
	Type of output	NPN, PNP	—	NPN	NPN
	Current carrying capacity, typical	1A	—	0.5A	0.5A
Applicable I/O connector		M12 connector (IEC 60947-5-2) See page 91	M8 connector (IEC 60947-5-2) See page 91		
Degree of protection (IEC 60529)		IP67 (with M12 connectors, mounting plate and cable)	IP67 (with M12, M8 connectors)		
Mounting method	Rail	Yes	—	—	—
	Screw	Yes	Yes	Yes	Yes
Mass		Approx. 115g (mounting plate: Approx. 35g included)	Approx. 70g		
Approval		CE	CE	CE	CE
Refer to		Page 05/41	Page 05/48	Page 05/48	Page 05/48

Note: *1 □ : "N" for NPN model, "P" for PNP model

■ Slave

Kind of slave		Flat dustproof slave				
Slave type		Standard slave			A/B slave	
Type		**FM4D-40XX □** [*1]	**FM4D-04TNX**	**FM4D-22T □ □** [*1]	**FM4DB-40XXN**	**FM4DB-03TNX**
		KK01-265A	KK01-266A	KK01-267A	KK04-005	
Input/output		4I (NPN, PNP)	4O (NPN)	2I/2O (NPN, PNP)	4I (NPN)	3O (NPN)
Current consumption (including sensors)		245mA DC or less	45mA DC or less	245mA DC or less	245mA DC or less	45mA DC or less
Sensor power supply	Sensor voltage range	20 to 27V (I ≦ 160mA) 18 to 27V (I ≦ 200mA)	—	20 to 27V (I ≦ 160mA) 18 to 27V (I ≦ 200mA)	20 to 27V (I ≦ 160mA) 18 to 27V (I ≦ 200mA)	—
	Current carrying capacity	200mA (Ta ≦ 25˚C) 160mA (Ta = 45˚C) 110mA (Ta = 70˚C)	—	200mA (Ta ≦ 25˚C) 160mA (Ta = 45˚C) 110mA (Ta = 70˚C)	200mA (Ta ≦ 25˚C) 160mA (Ta = 45˚C) 130mA (Ta = 60˚C)	—
Output (per point)	External power supply	—	24V DC	24V DC	—	24V DC
	Type of output	—	NPN	NPN, PNP	—	NPN
	Current carrying capacity, typical	—	0.2A	0.2A	—	0.2A
Applicable I/O connector		QZ-61-H4SFUT1 (for 0.08 to 0.2mm^2), QZ-61-H4SFUT2 (for 0.3mm^2) [*2]				
Degree of protection (IEC 60529)		IP40 (excluding terminal section)				
Mounting method	Rail	—	—	—	—	—
	Screw	Yes	Yes	Yes	Yes	Yes
Mass		Approx. 60g				
Approval		CE	CE	CE	CE	CE
Refer to		Page 05/58	Page 05/58	Page 05/58	Page 05/59	Page 05/59

Kind of slave		Slim dustproof slave			
Slave type		Standard slave		A/B slave	
Type		**FM4D1-40XXN**	**FM4D1-04TNX**	**FM4DB1-40XXN**	**FM4DB1-03TNX**
		KK02-211A		KK04-006	
Input/output		4I (NPN, PNP)	4O (NPN)	4I (NPN)	3O (NPN)
Current consumption (including sensors)		205mA DC or less	45mA DC or less	205mA DC or less	45mA DC or less
Sensor power supply	Sensor voltage range	20 to 27V (I ≦ 160mA)	—	20 to 27V (I ≦ 160mA)	—
	Current carrying capacity	160mA (Ta ≦ 25˚C) 130mA (Ta = 45˚C) 107.5mA (Ta = 60˚C)	—	160mA (Ta ≦ 25˚C) 130mA (Ta = 45˚C) 107.5mA (Ta = 60˚C)	—
Output (per point)	External power supply	—	24V DC	—	24V DC
	Type of output	—	NPN	—	NPN
	Current carrying capacity, typical	—	0.2A	—	0.2A
Applicable I/O connector		QZ-61-H4SFUT1 (for 0.08 to 0.2mm^2), QZ-61-H4SFUT2 (for 0.3mm^2) [*2]			
Degree of protection (IEC 60529)		IP40			
Mounting method	Rail	Yes			
	Screw	Yes			
Mass		Approx. 60g (including mounting plate)			
Approval		CE	CE	CE	CE
Refer to		Page 05/65	Page 05/65	Page 05/66	Page 05/66

Notes: [*1] □ : "N" for NPN model, "P" for PNP model [*2] For details, see page 91.

■ Slave

Kind of slave		Digital picking slave			
Slave type		Standard slave		A/B slave	
Type		**FM4DP2-GR1□** *1**,RR1□** *1	FM4DP2-GR1□S *1,RR1□S *1 NEW	**FM4DP0-001□S** *1 NEW	**FM4DP0-001□** *1 NEW
		KK04-009		KK05-219	
Input/output		—		—	
Current consumption (including sensors)		75mA DC or less		65mA DC or less	
Degree of protection (IEC 60529)		IP40		IP40	
Mounting method	Rail	—		—	
	Screw	Yes		Yes	
Mass		Approx. 72g (including mounting plate)		Approx. 72g (including mounting plate)	
Approval		—	—	—	—
Refer to		Page 05/78	Page 05/78	Page 05/79	Page 05/79

Kind of slave		Terminal block type slave			AS-i motor starter slave
Slave type		Standard slave			
Type		**FM2D1-04RQX**	**FM1D-22TPP**	**FM1D-22RQP**	**FE16D-SJ13RGNE12□□□** *2 **FE16D-SJ13RGEE12□□□** *2
		KK03-042	AF99-102		KK01-136A
Input/output		4O (Relay)	2I/2O (PNP)	2I/2O (Relay)	4I/4O (PNP)
Current consumption (including sensors)		60mA DC or less	50mA DC or less	50mA DC or less	50mA DC or less
Sensor power supply	Sensor voltage range	—	20 to 30V (25mA or less)	20 to 30V (25mA or less)	20 to 30V (25mA or less)
	Current carrying capacity	—	25mA (Ta ≦ 70˚C)	25mA (Ta ≦ 70˚C)	25mA (Ta ≦ 55˚C)
Output (per point)	External power supply	200V AC/24V DC	24V DC	230V AC	24V DC
	Type of output	Relay contact	PNP	Relay contact	PNP
	Current carrying capacity, typical	5A	2A	6A	0.3A
Applicable I/O connector		Screw connection	Screw connection	Screw connection	—
Degree of protection (IEC 60529)		IP20	IP20		IP65
Mounting method	Rail	Yes	Yes		—
	Screw	Yes	—		Yes
Mass		Approx. 70g	Approx. 150g		Approx. 2.2kg (including mounting plate)
Approval		CE	CE	CE	CE
Refer to		Page 05/70	Page 05/72	Page 05/72	Page 05/74

Notes: *1 □ : Illuminated pushbutton color "G" for green, "R" for red
*2 □□□ : Motor capacity and thermal overload relay range

■ Slave

Kind of slave		Water proof slave (analog slave)				
Type		**FM6A11-20**	**FM6A21-20**	**FM6A51-20**	**FM6A31-02**	**FM6A41-02**
		KK104-004				
Input/output		Current input 2-channel	Voltage input 2-channel	Resistance bulb input 2-channel	Current output 2-channel	Voltage output 2-channel
Current consumption		50mA DC or less			50mA DC or less	
External power	Operating voltage	24V DC			24V DC	
	Sensor voltage range	21.6 to 30V			21.6 to 30V	
	Current consumption	Max. 25mA + sensor supply current		Max. 25mA	Max. 40mA + output load current	Max. 35mA + output load current
Input/output range (chahged by parameter)		4 to 20mA 0 to 20mA	0 to 10V 1 to 5V	Pt100:-200 to +850˚C JPt100:-200 to +500˚C	4 to 20mA 0 to 20mA	0 to 10V 1 to 5V
Current tolerance		Max. 40mA	—	—	—	—
Voltage tolerance		—	±25V	—	—	—
Supply to external sensor		500mA or less (total of 2-channel)		—	—	—
Output current		—	—	—	Max. 24mA	—
Output voltage		—	—	—	—	Max. 12V
Applicable I/O connector		M12 connector (IEC 947-5-2)			M12 connector (IEC 947-5-2)	
Degree of protection (IEC 60529)		IP67			IP67	
Mounting method	Rail	Yes			Yes	
	Screw	Yes			Yes	
Mass		Approx. 120g (mounting plate:Approx. 35g included)			Approx. 120g (mounting plate:Approx. 35g included)	
Approval		CE				
Refer to		Page 05/53				

■ AS-i Safety

Description		Safety monitor		Safety monitor with enhanced functionality	
Type		**3RK1105-1AE04-0CA0**	**3RK1105-1BE04-0CA0**	**3RK1105-1AE04-2CA0**	**3RK1105-1BE04-2CA0**
		KK04-119			
Current consumption		150mA or less	200mA or less	150mA or less	200mA or less
No. of channels		1	2	1	2
Input	Start input	Photocoupler input (high active) Approx. 10mA (at 24V DC)			
	Protective control (EDM) input	Photocoupler input (high active) Approx. 10mA (at 24V DC)			
Output	Message output	PNP transistor output:200mA Short-circuit protection and polarity changeover protection			
	Safety output rated control current	Nonpotential NO contact Ie/AC-12: 2A at 250V AC max. Ie/AC-15: 2A at 115V AC, 2A at 230V AC Ie/DC-12: 2A at 24V DC max. Ie/DC-13: 1A at 24V DC, 0.1A 115V DC, 0.05A at 230V DC			
Degree of protection (IEC 60529)		IP20			
Mounting method	Rail	Yes			
	Screw	—			
Mass		Approx. 350g	Approx. 450g	Approx. 350g	Approx. 450g
Approval		UL, CSA, Marine			
Refer to		Page 05/21			

Description		K45F safe compact module
Slave type		Standard slave
Type		**3RK1205-0BQ00-0AA3**
		KK03-039
Input/output		4I
Current consumption		45mA or less
Input type		PNP (sink)
Input sensor		Mechanical contact
Low signal range		Contact open
High signal range		Contact closed Input current Ipeak ≧ 5mA
Applicable I/O connector		M12 connector (IEC 60947-5-2)
Degree of protection (IEC 60529)		IP67
Mounting method	Rail	Yes
	Screw	Yes
Mass		Approx. 135g (mounting plate: Approx.35g included)
Approval		UL, CSA, Marine
Refer to		Page 05/21

Description		AS-Interface EMERGNCY STOP pushbuttons	
Slave type		Standard slave	
Type		**3SF5811-0AA08**	**3SF5811-0AB08**
		KK05-001	KK05-002
Current consumption		60mA or less	
Low signal range		Contact open (Emergency stop button OFF)	
High signal ange		Contact closed (Emergency stop button ON) Input current Ipeak ≧ 5mA	
Degree of protection (IEC 60529)		IP65	
Mounting method	Rail	—	
	Screw	Yes	
Mass		Approx. 250g	
Approval		UL, CSA, Marine	
Refer to		Page 05/21	

AS-Interface Safety at Work, which transfers safety-related signals and I/O signals over a single bus.

AS-Interface Safety at Work (AS-i Safety) is an open network that can be added to existing AS-i systems to support EN954-1 category 4 (the highest safety class). With the globalization of both enterprises and standards (e.g., JIS), there is an increasing worldwide tendency to attach greater importance to safety in order to prevent labor accidents caused by machines. Against this background, FUJI has decided to market Siemens' AS-i Safety products.

Safety monitor

KK04-119

Safety slave

KK03-039

Emergency stop push-buttons

KK05-001

■ Features

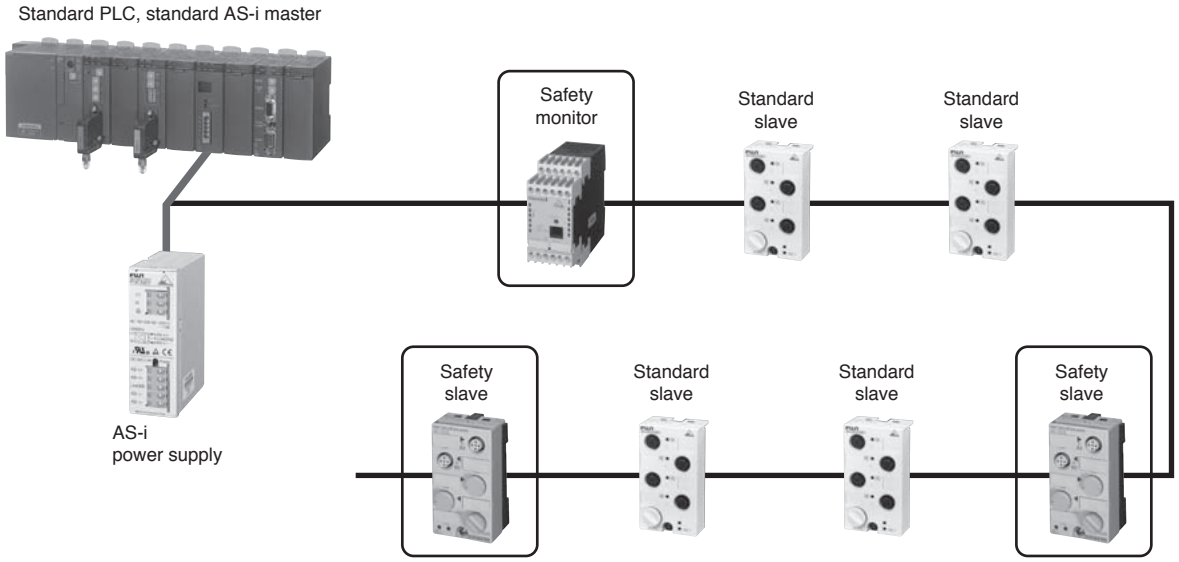
- AS-i Safety makes it possible to unify the safety components that handle all binary signals.
  Examples: Emergency pushbutton switches, safety door switches, safety limit switches, safety area sensors, and output circuit configurations.
- The simultaneous operation of a number of safety components is possible over standard AS-i cable.
- No safety PLC or special master is required for AS-i Safety.
- Quickly and easily expands existing systems.
- Safety signals can be grouped.
- System diagnosis is possible through a standard AS-i master and standard PLC.
- Supports up to EN954-1 category 4 (ISO 13849-1/JIS B9705-1).
- Functional safety: Supports up to SIL 3 (IEC 61508)
- High speed with a maximum response time of 40ms.
- Approved by TÜV and BIA (Institution for Statutory Accident Insurance and Prevention in Germany).
- Compatible with all AS-i components (IEC 62026-2 and EN 50295).
- The standard AS-i protocol is used to transfer safety signals.
- Connects to up to 30 safety slaves. (The number of safety slaves varies with the programming in the safety monitor.)
- Allows setting of stop categories 0 and 1 (EN 60204-1).

■ Types

Description		Type
Safety monitor	One 2-channel circuit	**3RK1105-1AE04-0CA0**
	Two 2-channel circuits	**3RK1105-1BE04-0CA0**
Safety monitor with enhanced functionality	One 2-channel circuit	**3RK1105-1AE04-2CA0**
	Two 2-channel circuits	**3RK1105-1BE04-2CA0**
Sealable cap		**3RP1902**
K45F safe compact module		**3RK1205-0BQ00-0AA3**
K45F mounting plate	Rail/screw dual mounting	**3RK1901-2DA00**
	Exclusive screw mounting	**3RK1901-2EA00**
Input jumper for K45F		**3RK1901-1AA00**
Configuration software		**3RK1802-2FB06-0GA0**
Cable set (Safety monitor to personal computer)		**3RK1901-5AA00**
AS-Interface EMERGENCY STOP pushbutton	Yellow cover	**3SF5811-0AA08**
	Yellow cover with protective collar	**3SF5811-0AB08**

■ Description

AS-i Safety added to the standard AS-i system allows the transmission of safety signals.

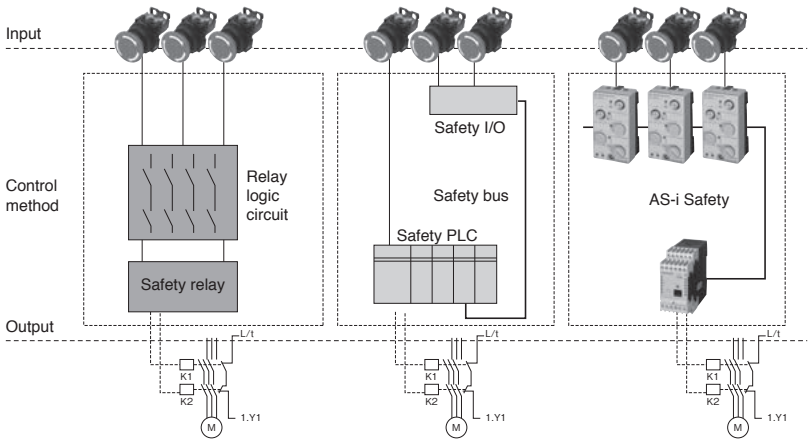


Safety network easily configured with safety monitor and safety slaves.

The safety monitor receives a signal from each safety slave in a cycle. The receiving signal continuously changes according to the defined algorithm. If a fault or alarm condition occurs and no signal is received, the safety monitor automatically switches off via the 2-channel operating circuit after waiting a maximum of 40 ms. Safety-related signals can be grouped when multiple safety monitors are installed on a network. It is also possible to view safety-related events via a human machine interface, etc. on a display.

■ Comparison between safety systems

Cost-effective I/O level network can be configured using AS-i safety system, compared with safety relays or safety PLCs.



■ Configuration of typical safety systems and advantages

(Where Safety Category Type 3 or 4 is requested.)

	Relay sequence using Safety Relays	Safety PLCs + Safety I/O terminals	AS-i Safety
Wiring	NG: Complicated relay wiring	Ordinary: Centralized wiring	Excellent: Common wiring to safety signals and control signals
Technical issues	Ordinary	Hard	Easy
Maintenance	NG: Relay maintenance	Excellent	Excellent
Scalability	Low	Ordinary	Scalable: Easy expansion
Total cost	Ordinary: Much expensive for complicated logic circuit	Expensive: Expensive hardware	Low

Safety devices

■ Safety monitor

The safety monitor is the core device of AS-i Safety (Safety at Work).
The configuration of safety-related devices connected to the safety monitor is defined by the PC.
A unique control mode according to the combination is selectable with the definition on the PC.
For example, emergency stop, electromagnetic lock safety door switch, two-handed operation, and category 0 or category 1 stop can be selected.
The monitor can be controlled using the AS-i address in order to make full use of the AS-i diagnostic function.
The following two types of monitor control are possible.

- A safety monitor with one 2-channel operating circuit.
- A safety monitor with two 2-channel operating circuits.

■ AS-Interface EMERGENCY STOP pushbuttons

Safety communications technology makes it possible to connect emergency stop devices directly to the standard AS-i.
The emergency pushbutton can be mounted inside or on the surface of the panel.

■ Safety slave

The safety slave is a compact module with two safety input terminals.
Two inputs can be used for applications extending up to category 3 safety class.
For category 4, one input point can be used.

Benefits

- Safety-related signals and I/O signals are transmitted over a single bus cable.
- No fail-safe PLC or special master is required.
- Safety-related signals can be grouped.
- A simple system structure making use of standardized AS-i technology.
- Existing systems can be quickly expanded.
- Safety-related signals can be built into plant diagnostic functions.
- Supports EN954-1 up to category 4
- AS-i Safety (Safety at Work) has been certified by TÜV (the German Association for Technical Inspection) and BIA (a German Institution for Statutory Accident Insurance and Prevention).

■ Specifications

Safety monitor

• General specifications

Item	Specification
Rated voltage	24V DC
Supply voltage range	20.4 to 27.6V DC
Power consumption	One 2-channel circuit type: 3.6W max. Two 2-channeli circuit type: 4.8W max.
Power-off retentive time	20ms
Response time	40ms max.
Start delay time	10s max.
Operating temperature	0 to +60˚C (No icing or no condensation)
Storage temperature	–30 to +70˚C (No icing or no condensation)
Degree of protection	Panel mounted type IP20
Cooling method	Natural cooling
Mass	One 2-channel circuit type: Approx. 350g Two 2-channel circuit type: Approx. 450g

Safety monitor KK04-119

• AS-i specifications

Item	Specification
Profile	Monitor 7F
ID code	7
IO code	F
Voltage range	18.5 to 31.6V
Current consumption	45mA max.

• Setting interface specifications

Item	Specification
Interface	RS-232C
Communications specifications	9600bps with no parity Start bit: 1, End bit: 1, Data bit: 8

• Input specifications

Item	Specification
Start input	Photocoupler input (high active) Approx. 10mA (at 24V DC)
Protective control (EDM) input	Photocoupler input (high active) Approx. 10mA (at 24V DC)

• LED indication

LED	State	Description
AS-i 1	OFF	No power
	Green LED ON	AS-i power supply
AS-i 2	OFF	Normal
	Red LED ON	Communication error
1READY (each channel)	OFF	—
	Yellow LED ON	Start/Restart lock ON
	Yellow LED flashing	External test required
2ON (each channel)	OFF	Safety output connection open
	Green LED ON	Safety output connection closed
	Green LED flashing	Delay time operating in stop category 1
3OFF/FAULT (each channel)	OFF	—
	Red LED ON	Safety output connection open
	Red LED flashing	Error

• Output specifications

Item	Specification
Message output (Safety on)	PNP transistor output: 200mA Short-circuit protection and polarity changeover protection
Safety output rated control current	Nonpotential NO contact Ie/AC-12: 2A at 250V AC Ie/AC-15: 2A at 115V AC, 2A at 230V AC Ie/DC-12: 2A at 24V DC Ie/DC-13: 1A at 24V DC, 0.1A at 115V DC 0.05A at 230V DC
Durability	Mechanical: $10x10^6$ operation Electrical :$100x10^3$ operation (230V AC, 3A, AC-15)
Fuse	Constant-speed breaking type (MT) with a maximum breaking current of 4A used externally.
Overvoltage category	3: Conforming to VDE0110 part 1 at a rated operating voltage of 300V AC.

K45F safe compact module

2 safe inputs

・Specifications

Item	Specification
ID code	B
IO configuration	0
Operating voltage	26.5 to 31.6V
Total current consumption	45mA max.
Input type	PNP (sink)
Input sensor	Mechanical contact
Low signal range	Contact open
High signal range	Contact closed Input current Ipeak≥5mA
Pin assignment of socket 1	Pin 1 and pin 2: acts on bits D0 and D1 = channel 1 Pin 3 and pin 4: acts on bits D2 and D3 = channel 2 Pin 5: not used
Pin assignment of socket 2	Pin 1 and pin 2: not used Pin 3 and pin 4: acts on bits D2 and D3 = channel 2 Pin 5: not used
Socket 3	Not used
Socket 4	Not used
Operating temperature	–20 to +85˚C (No icing or no condensation)
Storage temperature	–40 to +85˚C (No icing or no condensation)
Degree of protection	IP67
Cooling method	Natural cooling
Mass	Approx. 135g (mounting plate (optional): Approx. 35 included)
Approval	UL, CSA, Marine

K45F safe compact module

KK03-039

・LED indication

LED	State	Description
AS-i/FAULT	Green LED ON	Normal
	OFF	No power
	Red LED ON	Communication error
	(Red/Yellow) ON alternately	Address set to 0
F-IN1	OFF	No input
	Yellow LED ON	With input
F-IN2	OFF	No input
	Yellow LED ON	With input

AS-Interface EMERGENCY STOP pushbutton

Two NC contacts

・Specifications

Item	Specification
ID code	B
IO configuration	0
Operating voltage	26.5 to 31.6V
Total current consumption	60mA max.
Low signal range	Contact open (Emergency stop button OFF)
zHigh signal range	Contact closed (Emergency stop button ON) Input current: Ipeak≥5mA
Operating temperature	–25 to +70˚C (No icing or no condensation)
Storage temperature	–40 to +80˚C (No icing or no condensation)
Degree of protection	IP65
Cooling method	Natural cooling
Mass	Approx. 250g
Approval	UL, CSA, Marine

AS-Interface EMERGENCY STOP pushbutton

KK05-001

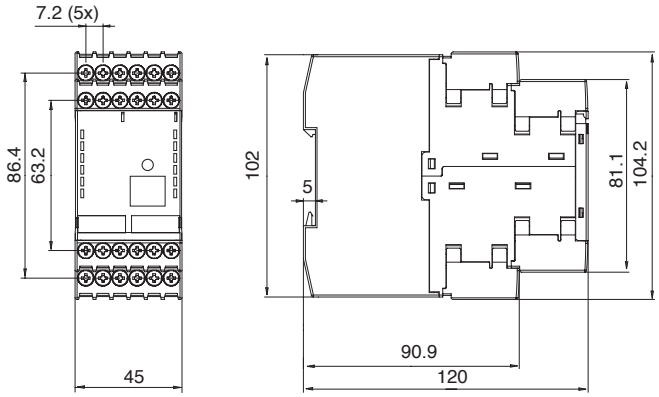
Yellow cover

Yellow cover with protective collar

KK05-002

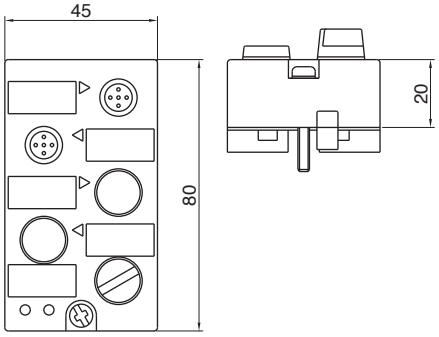
■ Dimensions, mm

・Safety monitor

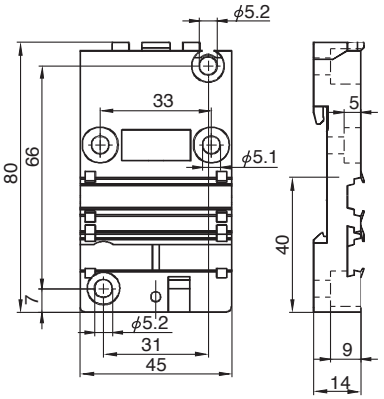


・K45F safe compact module

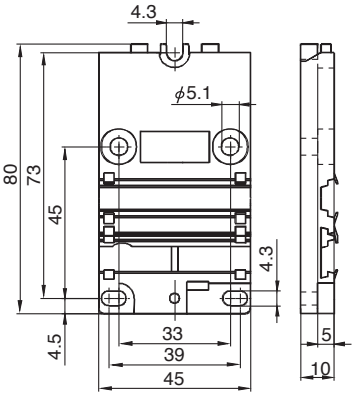
Actual slave



Mounting plate
Rail/screw dual mounting

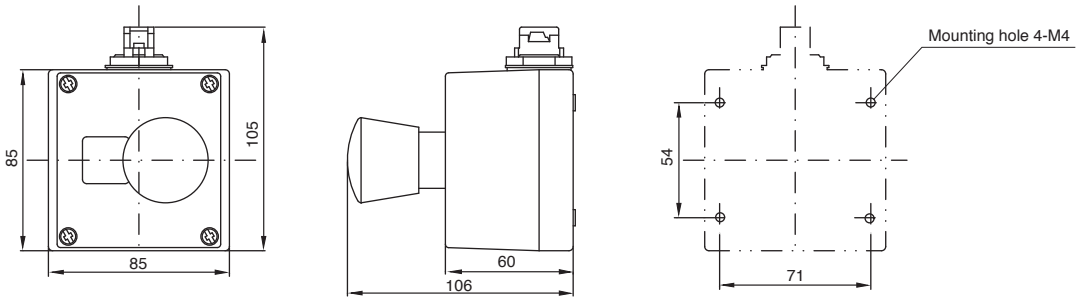


Exclusive screw mounting

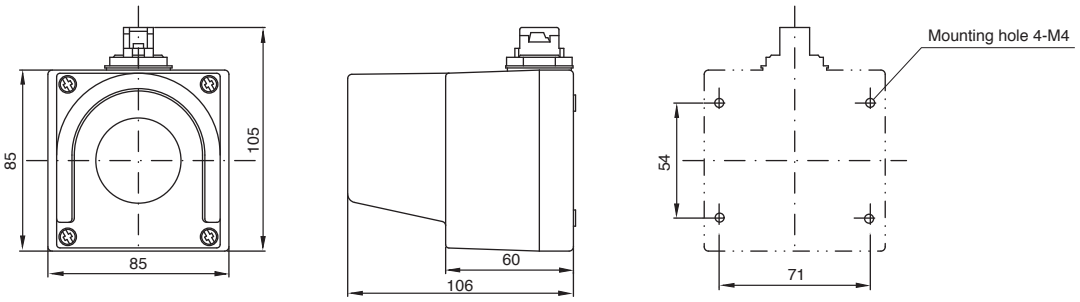


・AS-Intarface EMERGENCY STOP pushbutton

Yellow cover

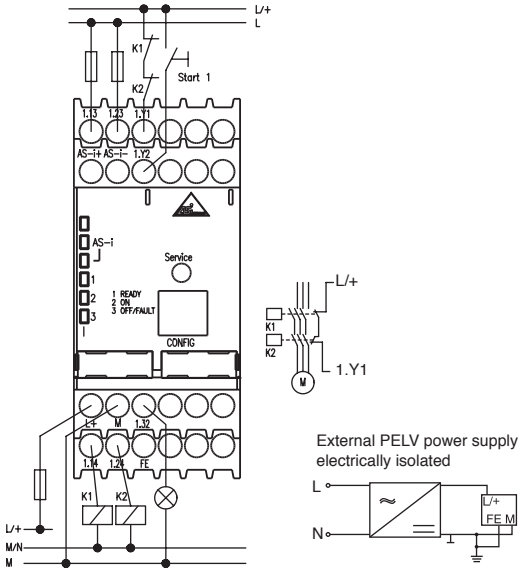


Yellow cover with protective collar

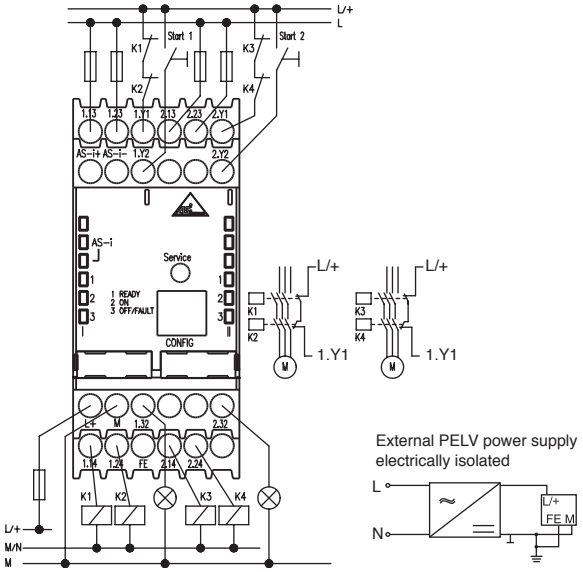


■ Wiring diagrams

• Safety monitor with one 2-channel circuit



• Safety monitor with 2 two-channel circuits



■ Product overview

Item	Description
Configuration software	This software is used to configure and set up the safety monitor on the PC (IBM PC/AT or compatible). A separately sold connection cable (3RK1901-5AA00) is required to make settings. (PC requirements) • A Pentium® or newer Intel® processor or a compatible AMD® or Cyrix® processor • CD-ROM drive • Mouse (recommended) • RS-232C serial interface (9-pin D-sub plug) • OS: Microsoft® Windows 95/98/ME/2000/XP®
Cable set	This cable connects the safety monitor and PC (IBM PC/AT or compatible). The PC connects with the RS-232C serial interface (9-pin D-sub plug).
Input jumper for K45F	This input jumper makes one channel of the safety slave always ON. This input jumper is used one when only channel out of two channels is used. With this jumper, Pin 1 and Pin 2 in K45F are connected internally.
Sealable cap	This cap is the spare of the protective cover for the configuration interface of the safety monitor. Each bag contains five caps. The safety monitor is provided with a single sealable cap.

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AS-Interface cables, FX3C

FX3CA □ Y(Yellow) **FX3CA □ B (Black)**

■ Description

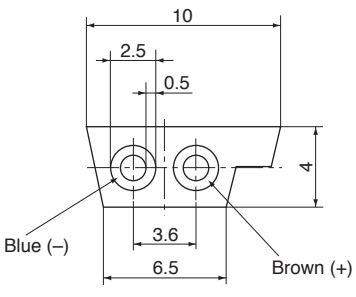
The AS-i cable is a two-core cable specially designed to connect AS-i devices. The yellow AS-i cable supplies 30V DC power to sensors and transfers data. The black AS-i cable can be used for 24V DC actuators (e.g., solenoid valves).

- A trapezoidal cross section is adopted to prevent polarity reversal.
- Both kinds of cable are available to suit environmental conditions: general-purpose (EPDM) and oil-tight (TPE) use.
- The connection uses the insulation piercing technology (IEC 60352-6).
- The cable's insulation recovers after the connected slaves are detached.
- Conforms to IEC 62026-2
- Approved by UL and CSA (Oil-tight (TPE) cable).
- RoHS compliant products.

■ Ratings and specifications

Type	**FX3CAEY**	**FX3CATY**	**FX3CAEB**	**FX3CATB**
Application	AS-i communications, 30V DC		24V DC external power supply	
Environmental condition	General-purpose use	Oil-tight use	General-purpose use	Oil-tight use
Cable color	Yellow		Black	
Cable sheath material (DIN VDE 0207)	Ethylene Propylene Diene Monomer (EPDM)	Thermoplastic Elastomers (TPE)	Ethylene Propylene Diene Monomer (EPDM)	Thermoplastic Elastomers (TPE)
Sheath color of core	Brown (AS-i (+)), Blue (AS-i (–))		Brown (24V DC (+)), Blue (0V)	
Core cross-section (IEC 60228)	2 x 1.5mm^2		2 x 1.5mm^2	
Cable length per packing	100m roll		100m roll	
Operating temperature	–25 to +85˚C	–30 to +105˚C	–25 to +85˚C	–30 to +105˚C
Smallest permissible bending radius (DIN VDE 0298 Part 300)	Fixed installed: 12mm Freely movable: 24mm		Fixed installed: 12mm Freely movable: 24mm	
Bending performance (IEC 60227)	No break after 30,000 back and forward movements		No break after 30,000 back and forward movements	
Behavior in fire (UL 1581)	Flammable	Flame-resistant	Flammable	Flame-resistant
Ozone and weather resistance	Non-resisting	Resisting	Non-resisting	Resisting
Oil resistance	Non-resisting	Resisting	Non-resisting	Resisting
Water soluble cutting fluid resistance	Resisting	Non-resisting	Resisting	Non-resisting
Approval	—	UL758, cUL, AWM style 2376	—	UL758, cUL, AWM style 2376

■ Dimensions, mm



AS-Interface master, NP1L-AS2

AF00-112

NP1L-AS2

■ Description

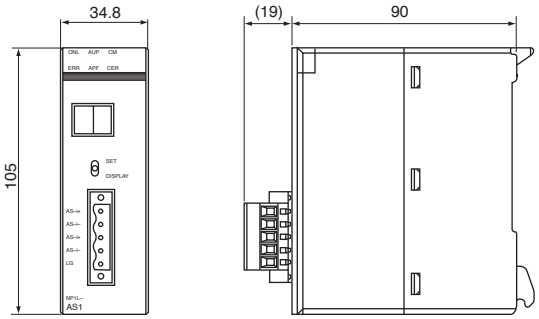
The NP1L-AS2 AS-i master, mounted on the base unit of the MICREX-SX series of SPH, communicates with devices on the AS-i bus.

- Up to 12 AS-i masters can be connected to one SX-bus configuration.
- Up to 62 A/B slaves can be connected.
- Up to 31 analog slaves can be connected.
- Addition of notification function of peripheral error.
- The slaves' configuration can be registered by a switch on the front of the AS-i master.
- The status of the AS-i bus is indicated by the LEDs on the AS-i master, e.g., showing disconnection of slaves, AS-i power supply failure, and automatic addressing availability.
- The 7-segment LED indicates the addresses of disconnected slaves (in protect mode) and configured slaves (in configuration mode).
- AS-i specification: V2.1

■ Ratings and specifications

Type	NP1L-AS2
Communications specifications	
Maximum connectable slaves	62 A/B slaves for V2.1 (addresses 1A to 31A, 1B to 31B) 31 standard slaves for V2.0 (addresses 1 to 31, Analog slaves are treated in the same way as standard slaves.)
Maximum No. of input/output points	434 points (When connecting A/B slaves: 248 input and 186 output points) 248 points (When connecting standard slaves: 124 input and 124 output points)
Network topology	Tree, line, and star structure
Max. cable length	Up to 100m (extendable up to 300m via repeater)
Transmission speed	167kbps
Transmission cable	AS-i cable (yellow), or parallel cable (2 x 1.5mm^2)
Cycle time	Approx. 10ms (with 62 slaves connected), Approx. 5ms (with 31 slaves connected)
Power supply for communications	AS-i power supply (30V DC)
AS-i current consumption	100mA or less
Function specifications	
No. of slots occupied	1
Maximum connectable AS-i masters	12 per configuration
Internal current consumption (at 24V)	100mA or less
General specifications	
Insulation resistance	10MΩ or more with 500V DC megger, between external terminals and FG
Dielectric strength	445V AC for 1min, between external terminals and FG
Operating temperature	0 to +55˚C (no icing or no condensation)
Storage temperature	–25 to +70˚C (no icing or no condensation)
Relative humidity	20 to 95% RH (no condensation)
Pollution degree	2 (no conductive dust)
Atmosphere	No corrosive gases, no organic solvent adhering to the master
Vibration resistance	Amplitude: 0.15mm, constant acceleration: 19.6m/s^2 for 2 hours in each direction
Shock resistance	147m/s^2 for 3 times in each direction (Peak acceleration)
Noise immunity	Noise simulator method: Rise time 1ns, pulse width 1μs, 1.5kVp-p
Electrostatic discharge resistance	Contact discharge method: ±6kV, Aerial discharge method: ±8kV
Degree of protection (IEC 60529)	IP30 (installation inside panel)
Cooling method	Natural cooling
Mass	Approx. 180g
Approval	CE

■ Dimensions, mm



■ LED indication

LED (G:Green, R:Red)		Description
LED indication	ONL (G)	ON under normal operation Flashing during SX bus setup
	AUP (G)	ON where automatic addressing is possible under protect mode
	CM (G)	ON where AS-i operation is under configuration mode On under protect mode
	ERR (R)	ON when the module is faulty
	APF (R)	ON where AS-i bus voltage is off or dropped (failure of AS-i power supply)
	CER (R)	ON where the current and configuration-registered slaves are different (any of LPS, ID code or I/O configuration is different)
7-segments LED		Indicates the factor of error by codes when error has occurred Indicates the station address of AS-i slave where error has occurred. Indicates the address of AS-i slave connected by using the setting switch

AS-Interface master, NP1L-AS1

■ Description

The NP1L-AS1 AS-i master, mounted on the base unit of the SX-bus in the MICREX-SX series of SPH, communicates with devices on the AS-i bus.

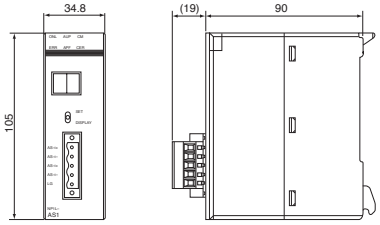
- Up to 19 AS-i masters can be connected to one SX-bus configuration.
- The slaves' configuration can be registered by a switch on the front of the AS-i master.
- The status of the AS-i bus is indicated by the LEDs on the AS-i master, e.g., showing disconnection of slaves, AS-i power supply failure, and automatic addressing availability.
- The 7-segment LED indicates the addresses of disconnected slaves (in protect mode) and configured slaves (in configuration mode).
- AS-i specification: V2.0

NP1L-AS1

■ Ratings and specifications

Type	**NP1L-AS1**
Communications specifications	
Maximum connectable slaves	31 (Max. points per slave: 4 inputs, 4 outputs)
Maximum No. of input/output points	248 points (Input: 124/Output: 124)
Network topology	Tree, line, and star structure
Max. cable length	Up to 100m (extendable up to 300m via repeater)
Transmission speed	167kbps
Transmission cable	AS-i cable (yellow), or parallel cable (2 x 1.5mm^2)
Cycle time	Max. 5ms (with 31 slaves)
Power supply for communications	AS-i power supply (30V DC)
AS-i current consumption	100mA or less
Function specifications	
No. of slots occupied	1
Maximum connectable AS-i masters	19 per configuration
Internal current consumption (at 24V)	100mA or less
General specifications	
Insulation resistance	10MΩ or more with 500V DC megger, between external terminals and FG
Dielectric strength	445V AC for 1min, between external terminals and FG
Operating temperature	0 to +55˚C (no icing or no condensation)
Storage temperature	–25 to +70˚C (no icing or no condensation)
Relative humidity	20 to 95% RH (no condensation)
Pollution degree	2 (no conductive dust)
Atmosphere	No corrosive gases, no organic solvent adhering to the master
Vibration resistance	Amplitude: 0.15mm, constant acceleration: 19.6m/s^2 for 2 hours in each direction
Shock resistance	147m/s^2 for 3 times in each direction (Peak acceleration)
Noise immunity	Noise simulator method: Rise time 1ns, pulse width 1μs, 1.5kVp-p
Electrostatic discharge resistance	Contact discharge method: ±6kV, Aerial discharge method: ±8kV
Degree of protection (IEC 60529)	IP30 (installation inside panel)
Cooling method	Natural cooling
Mass	Approx. 200g
Approval	CE

■ Dimensions, mm



For details of this product, see User's Manual No. FEH231.
For details of the MICREX-SX series of SPH, see catalog No. LEH982.

AS-Interface master, NJ-ASL

NJ-ASL

■ Description

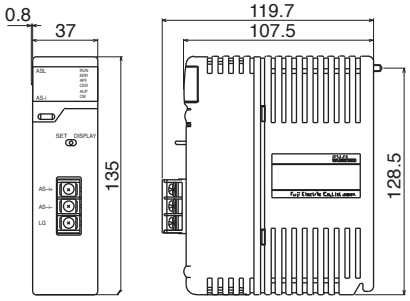
The NJ-ASL AS-i master, mounted on the CPU base unit of the FLEX-PC NJ series PLC, communicates with devices on the AS-i bus.

- The slaves' configuration can be registered by a toggle switch on the front of the AS-i master.
- The status of the AS-i bus is indicated by the LEDs on the AS-i master, e.g., showing disconnection of slaves, AS-i power supply failure, and automatic addressing availability.
- The 7-segment LED indicates the addresses of disconnected slaves (in protect mode) and configured slaves (in configuration mode).
- AS-i specification: V2.0

■ Ratings and specifications

Type	**NJ-ASL**
AS-i communications	
Maximum connectable slaves	31 (Max. points per slave: 4 inputs, 4 outputs)
Maximum No. of input/output points	248 points (Input: 124/Output: 124)
Network topology	Tree, line, and star structure
Max. cable length	Up to 100m (extendable up to 300m via repeaters)
Transmission speed	167kbps
Transmission cable	AS-i cable (yellow), or parallel cable (2 x 1.5mm^2)
Cycle time	Max. 5ms (with 31 slaves)
Power supply for communications	AS-i power supply (30V DC)
AS-i current consumptions	100mA or less
NJ series interface	
No. of slots occupied	1 (mountable on the CPU base unit)
Internal current consumption (at 5V)	250mA or less
General specifications	
Insulation resistance	10MΩ or more with 500V DC megger, between external terminals and FG
Dielectric strength	1500V AC for 1min, between external terminals and FG
Operating temperature	0 to +55˚C (no icing or no condensation)
Storage temperature	–20 to +70˚C (no icing or no condensation)
Relative humidity	20 to 95% RH (no condensation)
Pollution degree	2 (no conductive dust)
Atmosphere	No corrosive gases, no organic solvent adhering to the master
Vibration resistance	Amplitude: 0.15mm, constant acceleration: 19.6m/s^2 for 2 hours in each direction
Shock resistance	294m/s^2 destruction threshold (Peak acceleration)
Noise immunity	Noise simulator method: Rise time 1ns, pulse width 1μs, 1.5kVp-p
Electrostatic discharge resistance	Contact discharge method: ±8kV, aerial discharge method: ±15kV
Degree of protection (IEC 60529)	IP30 (installation inside panel)
Cooling method	Natural cooling
Mass	Approx. 230g
Approval	—

■ Dimensions, mm



AS-Interface master, NB6 basic unit

■ Description

This is a basic unit of the FLEX-PC NB series compact PLC, incorporating with the AS-i master function enhancing distributed I/O control. It can be used as a cell or line level PLC in FA or CIM systems, reducing wiring between equipment or machinery and saving installation space, to configure economical system.

- AS-i master function provided as standard.
- The status of the AS-i bus is indicated by the LED, such as disconnection of slaves, AS-i power supply failure, and automatic addressing availability.
- Various system configuration is available using 8-point expansion cassette, N-bus expansion unit, and NB series function units in addition to AS-i master function
- Program capacity 4K steps (RAM)
- EPROM and EEPROM operation supported (1K/4K steps)
- The AS-i specification: V2.0

■ Ratings and specifications

General specifications

Insulation resistance	5MΩ or more with 500V DC megger, between external terminals and FG
Dielectric strength	1500V AC for 1min, between external terminals and FG
Operating temperature	0 to +55˚C (no icing or no condensation)
Storage temperature	–20 to +70˚C (no icing or no condensation)
Relative humidity	20 to 95% RH (no condensation)
Pollution degree	Pollution degree 2 (no conductive dust)
Atmosphere	No corrosive gases, no organic solvent adhering to the master
Vibration resistance	Amplitude: 0.15mm, constant acceleration: 19.6m/s^2 for 2 hours in each direction
Shock resistance	294m/s^2 destruction threshold (Peak acceleration)
Noise immunity	Noise simulator method: Rise time 1ns, pulse width 1μs, 1.5kVp-p
Electrostatic discharge resistance	Contact discharge method: ±4kV, Aerial discharge method: ±8kV
Degree of protection	IP20 (installation inside panel)
Mounting method	Rail/screw dual mounting
Mass	Approx. 1kg
Approval	—

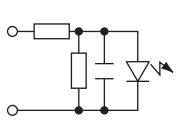
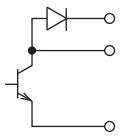
AF99-92

NB6P26T-14

Performance

Type	**NB6P26T-14**
Control system	Stored program cyclic operation system
I/O control system	Batched refreshing/direct refreshing method
Programming language	Mnemonic/ladder
Program capacity	4K steps (0 to 3965)
No. of input/output points	26 points (basic unit) Up to 512 points with expansion cassettee/ units
No. of instructions	Sequence instruction: 33 (0.61µs per step) Data instruction: 39 (average 100µs per step)
Program memory and capacity	C-MOS RAM, 4K steps (with built-in lithium battery backup)
Data memory element	C-MOS RAM (with lithium battery backup)
Input/output relay X,Y	512 points (basic unit: 26 points, AS-i: 248 points)
Internal relay M	1024 points
Keep relay K	1024 points
Special relay V	512 points
Timer T	512 points
Counter C	256 points
Data register D	1024 words
Special register Z	256 words
Pointer	For branch P: 256 points For interrupt I: 20 points
High speed counter	1-phase: 8 points (1.2kHz – 8 points) 2-phase: 4 points (1.2kHz – 4 points)
Parameter	• Time setting of user watchdog timer • Setting of constant scanning time • Specifying operation under normal condition • Specifying high speed counter operation • Setting of input filtering time
Self-diagnosis function	Program check, watchdog timer, detection of battery voltage, etc.
RAS	System RAS area, instruction RAS area, error notification area, nonfatal fault relay area, fatal fault relay area, system message area, user message area
Available tool	Handy program loader N-HLD012, handy monitor N-HLD022, common loader

Input/output specifications

Item	Input section 24V DC input	Output section Transistor output
Rated voltage	24V DC (19 to 30V)	24V DC (19 to 30V)
Operating voltage OFF → ON ON → OFF	 19 to 30V DC 0 to 3V DC	—
Input current	7mA/24V	—
Output current	—	0.5A per point
Min. load current	—	1mA
Response time OFF → ON ON → OFF	 0.5ms * 0.5ms *	 Approx. 1ms or less Approx. 1ms or less
Polarity	Source	Sink
Switching element	—	Transistor
Protection of switching element	—	Diode
Leakage current (ON state)	—	0.1mA (24V DC)
Voltage drop (ON state)	—	1V or less
No. of points	16 points, 16 points common	10 points, 10 points common
Operation indicator	LED indication for all points	
External wire connection	Screw terminal with washer	
Internal circuit		

Note: * Response time can be adjusted by changing parameters.

AS-i communication specifications

Maximum connectable slaves	31 (Max. points per slave: 4 inputs, 4 outputs)
Maximum No. of I/O points	248 points (max. 124 inputs, max. 124 outputs)
Network topology	Tree, line, star structure
Max. cable length	Up to 100m (up to 300m via repeaters)
Transmission speed	167kbps
Transmission cable	AS-i cable (yellow), or parallel cable (2 x 1.5mm^2)
Cycle time	Max 5ms (with 31 slaves)
Power supply for communications	AS-i power supply (30V DC)
AS-i current consumption	120mA or less

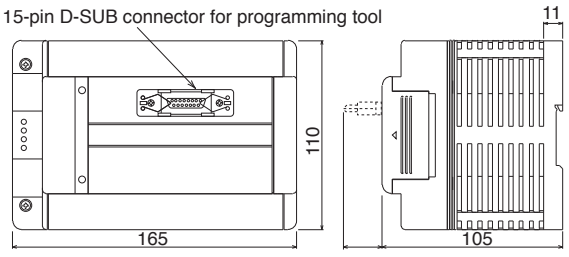
N-bus communication specifications

No. of connectable units		1 basic unit + 3 expansion units + 4 function units
Transmission	Distance	Up to 10m
	Cable	Dedicated cable
	Speed	76.8kbps

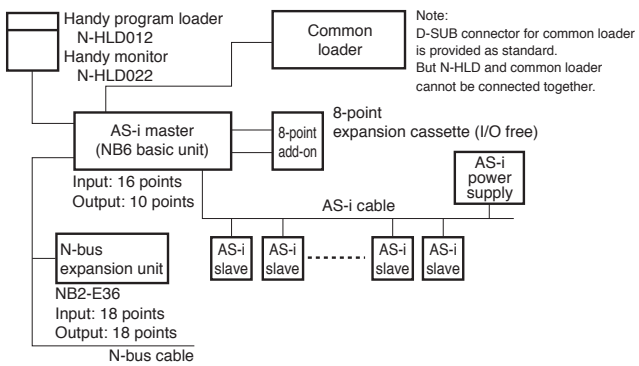
Input power specifications

Supply voltage	24V DC
Supply voltage range	19 to 30V DC
Power consumption	Max. 15W
Retention at power failure	5ms or more
Inrush current	Approx. 150A
External power supply	None

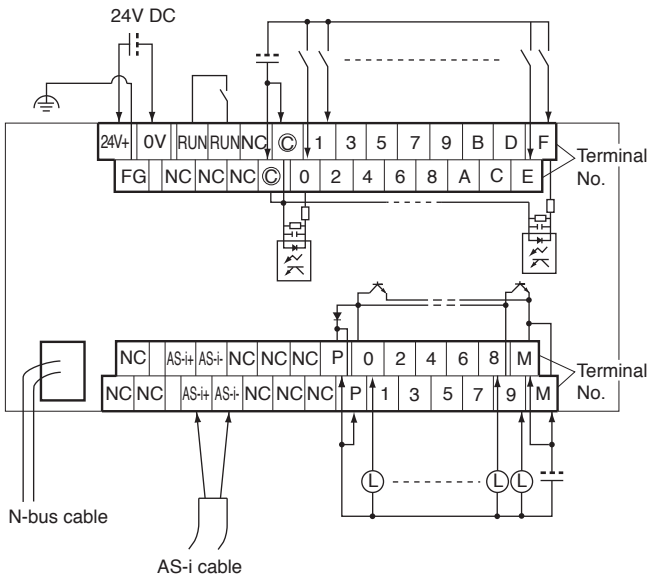
■ Dimensions, mm



■ System configuration



■ External wiring diagram


24V DC
24V+ 0V RUN RUN NC © 1 3 5 7 9 B D F
FG NC NC NC © 0 2 4 6 8 A C E
Terminal No.
NC AS-i+ AS-i- NC NC NC P 0 2 4 6 8 M
NC NC AS-i+ AS-i- NC NC NC P 1 3 5 7 9 M
Terminal No.
N-bus cable
AS-i cable

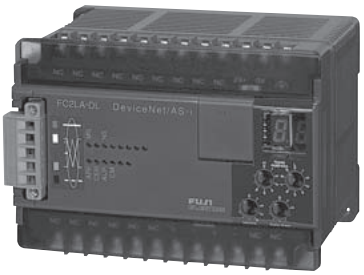
AS-i+ terminals are internally connected. AS-i – terminals are internally connected.
Use these terminals for branch connection to AS-i power supply.

DeviceNet/AS-i gateway, FC2LA-DL

■ Description

The DeviceNet/AS-i gateway converts data between the open network DeviceNet and the AS-Interface protocol. DeviceNet was developed and is supported by the Open DeviceNet Vendor Association (ODVA).

- Up to 62 A/B slaves can be connected.
- Up to 31 analog slaves can be connected.
- Addition of notification function of peripheral error.
- Being upward compatible with the conventional FC2L-DL conforming to AS-i specifications V2.0, replacement is easy.
- The slaves' configuration can be registered by a pushbutton switch on the front of the gateway.
- The status of the AS-i bus is indicated by the LEDs on the DeviceNet/AS-i gateway, e.g., showing disconnection of slaves, AS-i power supply failure, and automatic addressing availability.
- The 7-segment LED indicates the addresses of disconnected slaves (in protected mode) and configured slaves (in configuration mode).
- AS-i specification: V2.1



FC2LA-DL

■ Ratings and specifications

General specifications

Type	**FC2LA-DL**
Insulation resistance (Communication sections excluded)	10MΩ or more with 500V DC megger, between external terminals connected together and FG
Dielectric strength (Communication sections excluded)	445V AC for 1min, between external terminals connected together and FG
Operating temperature	0 to +55˚C (no icing or no condensation)
Storage temperature	–20 to +70˚C (no icing or no condensation)
Relative humidity	20 to 90% RH (no condensation)
Pollution degree	Pollution degree 2 (no conductive dust)
Atmosphere	No corrosive gases and massive dust
Vibration resistance *	Amplitude: 0.15mm Constant acceleration: 19.6m/s^2 for 2 hours in each direction
Shock resistance *	294m/s^2 destruction threshold (Peak acceleration)
Noise immunity	Noise simulator method: Rise time 1ns, pulse width 1µs, 1.5kVp-p
Electrostatic discharge resistance	Contact discharge method: ±6kV, Aerial discharge method: ±8kV
Degree of protection (IEC 60529)	IP20 (installation inside panel)
Mounting method	IEC rail/screw dual mounting
Cooling method	Natural cooling
Mass	Approx. 320g
Approval	CE

Note: * Resistance where the DeviceNet/AS-i gateway is screw-mounted. Less vibration and shock are permitted when IEC rail-mounted.

DeviceNet communications

Applicable DeviceNet specification		Release 2.0		
Power supply for communication		24V DC (operating voltage range: 11 to 25V DC)		
Current consumption		80mA or less		
Type of node		Group2 Only Server		
Vendor ID		0x13F (Fuji Electric)		
Device type		Communication adapter (Code: 0x0C)		
Station number setting (MAC address)		64 stations with numbers from 01 to 63, but no overlaps of number		
Cable length	Transmission speed	500kbps	250kbps	125kbps
	Trunk line	100m	250m	500m
	Drop line	6m	6m	6m
	Total drop line	39m	78m	156m
No. of message connection		1 (Pre-defined master/slave connection set)		
No. of I/O connection		1 (Polling)		
No. of Transmission data (fragmentized)		8/16/32/26/42 bytes (Mode 0 to 4 changeable)		
No. of Receiving data (frgmentized)		8/16/32/26/42 bytes (Mode 0 to 4 changeable)		
Cable		Dedicated DeviceNet cable		

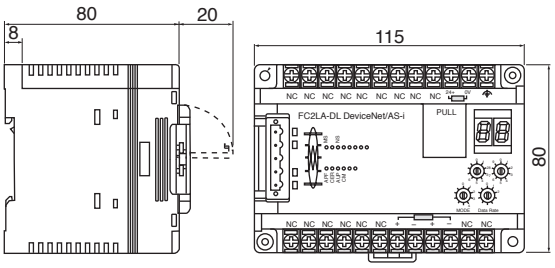
AS-i communications

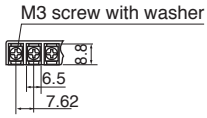
Maximum connectable slaves	62 A/B slaves for V2.1 (addresses 1A to 31A, 1B to 31B) 31 standard slaves for V2.0 (addresses 1 to 31, Analog slaves /standard slaves.)
Maximum No. of input/output points	434 points (When connecting A/B slaves: 248 input and 186 output points) 248 points (When connecting standard slaves: 124 input and 124 output points)
Network topology	Tree, line, and star structure
Maximum cable length	Up to 100m (extendable up to 300m via Repeaters)
Transminssion speed	167kbps
Transmission cable	AS-i cable (yellow) or parallel cable (2 x 1.5mm^2)
Cycle time	Approx. 10 (5) ms (with 62 (31) slaves connected)
Power supply for communication	AS-i power supply (30V DC)
AS-i current consumption	120mA or less

Input power specifications

Supply voltage (permissible range)	24V DC (19 to 30V DC)
Power consumption	Max. 3.3W
Retention at power failure	—
Inrush current	Approx. 8A

■ Dimensions, mm

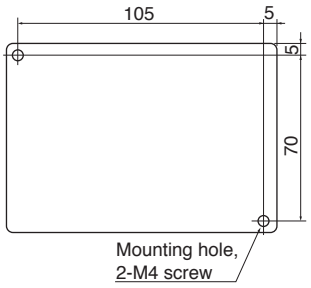




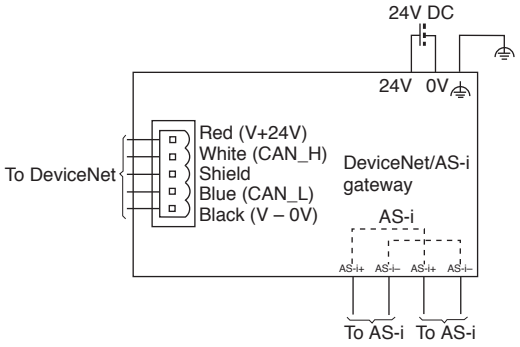
Details of terminal section

Tightening torque	0.5 to 0.7N•m
Applicable crimp terminal	ϕ 6.2 or less

Panel drilling



■ External wiring diagram



The two “AS-i +” terminals are connected internally. The same is true for the two “AS-i –” terminals. Use these terminals for branch connection to the AS-i power supply.
The recommended tightening torque of the supplied DeviceNet connectors is 0.5 to 0.6N·m for 5 wire mounting screws and 0.4N·m for 2 connector screws.

■ Mounting method

DeviceNet/AS-i gateways can be mounted in a control panel using either IEC rail mounting or screw mounting.

IEC rail mounting

Mount the DeviceNet/AS-i gateway on a 35mm IEC rail (IEC 60715) and fix it with mounting brackets (type: TS-XT) (sold separately) on both sides.

35mm IEC rail

Type	Height (mm)	Length (mm)	Material
TH35-7.5	7.5	900	Iron
TH35-7.5AL	7.5	900	Aluminum
TH35-15AL	15	900	Aluminum

Screw mounting

Drill two mounting holes in the control panel and fix the gateway with two M4 x 16 screws.
Tightening torque: 1.2 to 1.4 N.m.

■ LED indication

LED (G: Green, R: Red)		Description	
DeviceNet	MS (G/R)	OFF	No power
		(G) ON	Device operational
		(R) ON	Unrecoverable fault
	NS (G/R)	OFF	Not powered/not on-line
		(G) flashing	On-line, not connected
		(G) ON	Link OK (on-line, connected)
		(R) flashing	Connection time-out
		(R) ON	Critical Link failure
AS-i	APF (R)	ON at voltage drop or power failure of AS-i power	
	CER (R)	ON where the current and registered configuration are different.	
	AUP (G)	ON where automatic addressing is possible under protect mode	
	CM (G)	ON: in configuration mode, OFF: in protect mode.	
Address	7-segment 2-digit LED	Address of AS-i slave where error has occurred, error number, "88" indication where the AS-i power is off or during initializing.	

- The DeviceNet/AS-i gateway is in configuration mode at factory shipment.
- The slave's configuration information registered at factory shipment is based on the delivery inspection which was carried out by connecting the minimum number of slaves. When the slaves has to be connected to the gateway for the first time, the red "CER" LED will go on as the configuration information is different. To reset the error, press the "SET" switch for more than 5 seconds to register a new configuration.

T-link/AS-i gateway, FC2L-TL

■ Description

The FC2L-TL T-link/AS-i gateway converts data between a proprietary network T-link and the AS-i protocol. The T-link was developed and is supported by Fuji Electric Co., Ltd.

- The slaves' configuration can be registered by a pushbutton switch on the front of the gateway.
- The status of the AS-i bus is indicated by the LEDs on the T-link/AS-i gateway, e.g., showing disconnection of slaves, AS-i power supply failure, and automatic addressing availability.
- The 7-segment LED indicates the addresses of disconnected slaves (in protected mode) and configured slaves (in configuration mode).
- Simple connection reduces man-hours.
- AS-i specification: V2.0

KK01-298A

FC2L-TL

■ Ratings and specifications

General specifications

Type	**FC2L-TL**
Insulation resistance (Communication sections excluded)	5MΩ or more with 500V DC megger, between external terminals connected together and FG
Dielectric strength (Communication sections excluded)	1500V AC for 1min, between external terminals connected together and FG
Operating temperature	0 to +55˚C (no icing or no condensation)
Storage temperature	–20 to +70˚C (no icing or no condensation)
Relative humidity	20 to 90% RH (no condensation)
Pollution degree	Pollution degree 2 (no conductive dust)
Atmosphere	No corrosive gases and massive dust
Vibration resistance *	Amplitude: 0.15mm Constant acceleration: 19.6m/s^2 for 2 hours in each direction
Shock resistance *	294m/s^2 destruction threshold (Peak acceleration)
Noise immunity	Noise simulator method: Rise time 1ns, pulse width 1μs, 1.5kVp-p
Electrostatic discharge resistance	Contact discharge method: ±6kV, Aerial discharge method: ±8kV
Degree of protection (IEC60529)	IP20 (installation inside panel)
Mounting method	IEC rail/screw dual mounting
Cooling method	Natural cooling
Mass	Approx. 320g
Approval	—

Note: *Resistance where the T-link/AS-i gateway is screw-mounted. Less vibration and shock are permitted when IEC rail-mounted.

T-link communication

Station number setting	00 to 99
Transmission speed	500kbps
Maximum transmission distance	1000m with T-link cable
No. of words occupied	Input 8W/output 8W = Total 16 words
Network topology	Daisy chain
Cable	Shielded twist pair cable

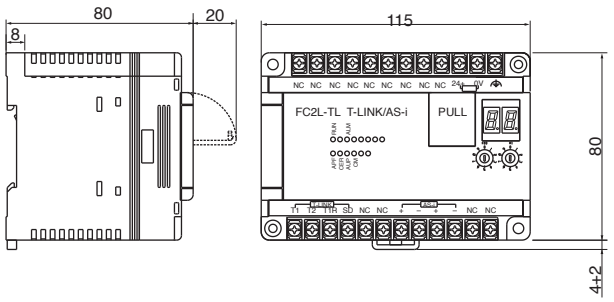
AS-interface communications

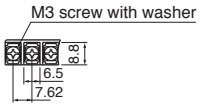
Maximum connectable slaves	31 (with addresses from 1 to 31) Max. points per slave: 4 inputs, 4 outputs
Maximum No. of input/output points	248 points (Input: 124/Output: 124)
Network topology	Tree, line, and star structure
Maximum cable length	100m (extendable up to 300m via Repeater)
Transmission speed	167kbps
Transmission cable	AS-i cable (yellow) or parallel cable (2 x 1.5mm^2), (also used as power cable)
Cycle time	Max. 5ms (with 31 slaves)
Power supply for communication	Use of AS-i power supply (30V DC)
AS-i current consumption	120mA or less

Input power specifications

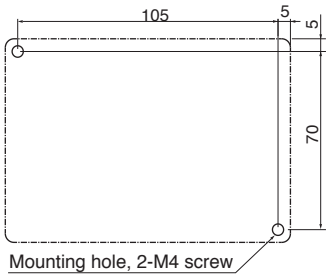
Supply voltage (permissible range)	24V DC (19 to 30V DC)
Power consumption	Max. 3.3W
Retention at power failure	—
Inrush current	Approx. 8A

Dimensions, mm





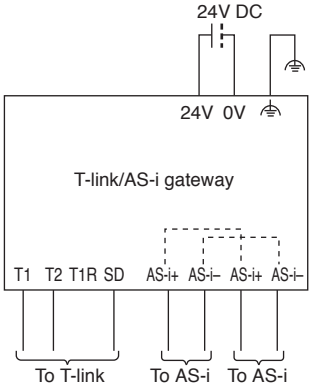
Panel drilling



Details of terminal section

Tightening torque	0.5 to 0.7N•m
Applicable crimp terminal	ϕ6.2 or less

External wiring diagram



Two "AS-i +" terminals are connected internally. The same is true for two "AS-i –" terminals. Use these terminals for branch connection to the AS-i power supply.

Notes: • If the T-link/AS-i gateway is removed during T-link communication, the transmission line will be split into two. When it is necessary to attach or remove a gateway during communication, tighten the two cables on both sides using crimp terminals.
• A terminating resistor is built into the gateway. To connect the T-link/AS-i gateway at the end of a T-link transmission line, connect terminals T1 and T1R with jumper wire.

Mounting method

T-link/AS-i gateways can be mounted in a control panel using either IEC rail mounting or screw mounting.

IEC rail mounting

Mount the T-link/AS-i gateway on a 35mm IEC rail (IEC60715) and fix it with mounting brackets (type: TS-XT) (sold separately) on both sides.

35mm IEC rail

Type	Height (mm)	Length (mm)	Material
TH35-7.5	7.5	900	Iron
TH35-7.5AL	7.5	900	Aluminum
TH35-15AL	15	900	Aluminum

Screw mounting

Drill two mounting holes in the control panel and fix the gateway with two M4 x 16 screws.
Tightening torque: 1.2 to 1.4 N.m.

Indication

LED indication

LED (G: Green, R: Red)		Description
T-link	RUN (G)	Status. See the table below.
	ALM (R)	
AS-i	APF (R)	ON at voltage drop or power failure of AS-i power
	CER (R)	ON where the current and registered configuration are different.
	AUP (G)	ON where automatic addressing is possible under protect mode
	CM (G)	ON: in configuration mode, OFF: in protect mode.
Address	7-segment 2-digit LED	Address of AS-i slave where error has occurred, error number, "88" indication where the AS-i power is off or during initializing.

Details of RUN, ALM LED indication

RUN (G)	ALM (R)	Status	Description
Flashing	OFF	Normal	No masters are connected to T-link. (Communication ready)
ON	OFF	Normal	Under normal communication with T-link
ON	ON	Error	Communication shut down with "hold" request. AS-i section in the T-link/AS-i gateway is faulty.
OFF	ON	Error	Station number setting switch changed under communication. Hardware of T-link/AS-i gateway is faulty.
OFF	OFF	Error	No power input to T-link/AS-i gateway

• The DeviceNet/AS-i gateway is in configuration mode at factory shipment.
• The slave's configuration information registered at factory shipment is based on the delivery inspection which was carried out by connecting the minimum number of slaves. When the slaves has to be connected to the gateway for the first time, the red "CER" LED will go on as the configuration information is different. To reset the error, press the "SET" switch for more than 5 seconds to register a new configuration.
• For the function of the "SET" switch, refer to User's Manual No. FH701 (Japanese only).

Waterproof slave (Flat type), FM6D1/FM6DB1

■ Description

The slave inclueds an upper section, which is the actual slave, and a lower section, which is the mounting plate. The IP67 structure provides excellent environmental resistance. By allowing use outside the control panel, the slave eliminates the need for relay boxes and contributes to downsizing. The slave is also flatter than conventional slaves and reduces restrictions on installation.

- The depth, including the mounting plate, is only 30mm, which is 15mm flatter than conventional models.
- The actual slave can be easily fixed to the mounting plate using one screw.
- Mounting plates are available in two types: IEC rail/screw dual mounting and exclusive screw mounting.
- Slave addressing is done by connecting an addressing unit to the front of the slave.
- LED indication of external power supply (2I/2O and 4O models only)
- Both NPN and PNP models are available.
- The slave can be easily connected to the AS-i flat cable by insulation piercing connection.
- The FM6D1-40XX□CM can be mounted side-by side together with output slaves having 2 input/2 outputs or 4 outputs.
- Short-circuit protection is provided for the sensor power supply and output circuit.
- Actuators and sensors can be easily connected by single-action M12 connectors (IEC60947-5-2).
- Two outputs or inputs per M12 connector.
- Conforms to EC Directive
  ENC Directive (No. 89/336/EEC); EN50081-1, EN61000-6-2 (EN50082-2).
- AS-i specification: V2.0, V2.1

KKD05-248

KKD05-242

KKD05-244

Actual slave

FM6D1-40XXN **FM6D1-04TPX** **FM6D1-40XXNCM**

KKD05-246

FM6DB1-40XXN

AF01-78

Mounting plate

FM6B1-04FK

05

■ Ratings and specifications

Type (actual slave)	NPN model		**FM6D1-40XXN** **FM6D1-40XXNCM**	**FM6D1-04TNX**	**FM6D1-22TNN**
	PNP model		**FM6D1-40XXP** **FM6D1-40XXPCM**	**FM6D1-04TPX**	**FM6D1-22TPP**
Slave type			Standard slave		
Number of inputs/outputs			4 inputs	4 outputs	2 inputs/2 outputs
Applicable mounting plate			**FM6B □ -04FK**	**FM6B □ -04FE**	
AS-Interface profile (I/O, ID)			0, 1	8, 1	3, 1
Operating voltage (in accordance with AS-i specification)			26.5 to 31.6V DC		
Current consumption	Slave only		45mA DC or less	45mA DC or less	45mA DC or less
	Including sensors		245mA DC or less	—	245mA DC or less
LED indication G: Green R: Red Y: Yellow	AS-i (G/R)		G on: Normal operation, R on: Communication error, R on and Orange (G+R) on alternating: Slave has address = 0, R flashing: Input power overload, Off: AS-i power off		
	EXT POWER (G)		—	On/off: 24V DC external power on/off	
	IN1 to IN4 (or 2) (Y)		On/off: Input on/off	—	On/off: Input on/off
	OUT1 (or 3) to OUT4 (Y)		—	On/off: Output on/off	On/off: Output on/off
Input	NPN	On voltage (Power supply (+) - Input)	10V or more	—	10V or more
		Off voltage (Power supply (+) - Input)	6V or less	—	6V or less
		On current (sorurce)	Approx. 5mA	—	Approx. 5mA
		Off current	1.5mA or less	—	1.5mA or less
	PNP	On voltage (Power supply (-) - Input)	10V or more	—	10V or more
		Off voitage (Power supply (-) - Input)	6V or less	—	6V or less
		On current (sink)	Approx. 5mA	—	Approx. 5mA
		Off current	1.5mA or less	—	1.5mA or less
Sensor power supply via AS-i cable	Short-circuit and overload protection		Built-in	—	Built-in
	Sensor voltage range		20 to 27V (I ≦ 160mA) 18 to 27V (I ≦ 200mA)	—	20 to 27V (I ≦ 160mA) 18 to 27V (I ≦ 200mA)
	Current carrying capacity for all inputs *		200mA (Ta ≦ 25˚C) 160mA (Ta = 45˚C) 80mA (Ta = 80˚C)	—	200mA (Ta ≦ 25˚C) 160mA (Ta = 45˚C) 80mA (Ta = 80˚C)
Output (per point)	External power supply 24V DC		—	Via black AS-i flat cable	Via black AS-i flat cable
	Operating voltage range		—	20 to 30V DC	20 to 30V DC
	NPN model		—	NPN transistor	NPN transistor
	PNP model		—	PNP transistor	PNP transistor
	Current carrying capacity per point		—	Approx. 1A	Approx. 1A
	Voltage drop		—	0.8V or less	0.8V or less
	Short-circuit protection		—	Built-in	Built-in
	Inductive surge protection		—	Built-in	Built-in
	Output status on communication error		—	Off	Off
Degree of protection (IEC60529)			IP67 (with M12 connectors, slave mounting plate and AS-i cable)		
Rated temperature Operating temperature Storage temperature			25˚C –25 to +85˚C (no icing or no condensation) –25 to +85˚C (no icing or no condensation)		
Supply method of external power			—	Via mounting plate	
Electrical protection for AS-i connection	Reverse polarity protection		Built-in		
	Electrostatic discharge resistance		Contact discharge method: ±4kV Aerial discharge method: ±8kV, IEC 61000-4-2 (Class B)		
	Electromagnetic field noise immunity		80MHz to 1000MHz, Electric field strength: 10V/m, IEC 61000-4-3 (Class A)		
	Burst noise		2kV (Class B)/1kV (Class A), IEC 61000-4-4		
Vibration resistance	Rail mounting (IEC 68-2-6)		10 to 55Hz, 0.5mm one-way amplitude		
	Screw mounting (IEC 68-2-6)		10 to 55Hz, 1mm one-way amplitude		
Shock resistance	Rail mounting (IEC 68-2-27)		150m/s^2 (11ms)		
	Screw mounting (IEC 68-2-27)		300m/s^2 (18ms)		
CE marking	Low Voltage Directive (No.: 73/23/EEC)		—		
	EMC Directive (No.: 89/336/EEC)		EN50081-1, EN61000-6-2 (EN50082-2)		
Mass			Approx. 115g (including mounting plate, approx. 35g, sold separately)		
Addressing method (Addresses: between 1 and 31)			Can be done with an addressing unit (FL1HA-E) via an addressing cable (FX9Y002) connected to the addressing jack on the front of the slave. Connecting the addressing cable to a slave will disconnect the slave from the AS-i connection.		
Approval			CE		

Note: * If a sensor with power consumption of more than 200mA is connected to the sensor power supply of the slave, the overload and short-circuit protective function will operate and the sensor power supply will be stopped even when 0.5ms has passed after the inrush current is generated. If a connected sensor has a high inrush current, make sure that current consumption with a lapse of 0.5 ms after the inrush current is 200 mA or less.

■ Ratings and specifications

Type (actual slave)	NPN model PNP model		**FM6DB1-40XXN** **FM6DB1-40XXP**	**FM6DB1-03TNX** **FM6DB1-03TPX**
Slave type			A/B slave	
Number of inputs/outputs			4 inputs	3 outputs
AS-Interface profile (I/O, ID, ID2) *1			0, A, 2	8, A, 2
Operating voltage (in accordance with AS-i specification)			26.5 to 31.6V DC	
Current consumption	Slave only Including sensors		45mA DC or less 245mA DC or less	45mA DC or less —
LED indication G: Green R: Red Y: Yellow	AS-i (G/R)		G on: Normal operation, R on: Communication error, R on and Orange (G+R) on alternating: Slave has address = 0, R flashing: Input power overload, Off: AS-i power off	
	EXT POWER (G)		—	On/off: 24V DC external power on/off
	IN1 to IN4 (Y) OUT1 to OUT3 (Y)		On/off: Input on/off —	— On/off: Output on/off
Input	NPN	On voltage (Power supply (+) - Input)	10V or more	—
		Off voltage (Power supply (+) - Input)	6V or less	—
		On current (sorurce)	Approx. 5mA	—
		Off current	1.5mA or less	—
	PNP	On voltage (Power supply (+) - Input)	10V or more	—
		Off voltage (Power supply (+) - Input)	6V or less	—
		On current (sink)	Approx. 5mA	—
		Off current	1.5mA or less	—
Sensor power supply via AS-i cable	Short-circuit and overload protection		Built-in	—
	Sensor voltage range		20 to 27V (I ≦ 160mA) 18 to 27V (I ≦ 200mA)	—
	Current carrying capacity for all inputs *2		200mA (Ta ≦ 25˚C) 160mA (Ta = 45˚C) 130mA (Ta = 60˚C)	—
Output (per point)	External power supply 24V DC		—	Via black AS-i flat cable
	Oprating voltage range		—	20 to 30V DC
	NPN model		—	NPN transistor
	PNP model		—	PNP transistor
	Current carrying capacity per point		—	Approx. 1A
	Residual voltage		—	0.8V or less
	Short-circuit protection		—	Built-in
	Inductive surge protection		—	Built-in
	Output status on communication error		—	Off
Degree of protection (IEC60529)			IP67 (with M12 connectors, slave mounting plate and AS-i cable, sold separately)	
Rated temperature Operating temperature Storage temperature			25˚C –25 to +60˚C (no icing or no condensation) –25 to +85˚C (no icing or no condensation)	
Supply method of external power			—	Via mounting plate
Electrical protection for AS-i connection	Reverse polarity protection		Built-in	
	Electrostatic discharge resistance		Contact discharge method: ±4kV Aerial discharge method: ±8kV, IEC 61000-4-2 (Class B)	
	Electromagnetic field noise immunity		80MHz to 1000MHz, Electric field strength: 10V/m, IEC61000-4-3 (Class A)	
	Burst noise		2kV (Class B)/1kV (Class A), IEC 61000-4-4	
Vibration resistance	Rail mounting (IEC 68-2-6) Screw mounting (IEC 68-2-6)		10 to 55Hz, 0.5mm one-way amplitude 10 to 55Hz, 1mm one-way amplitude	
Shock resistance	Rail mounting (IEC 68-2-27) Screw mounting (IEC 68-2-27)		150m/s^2 (18ms) 300m/s^2 (11ms)	
Mass			Approx. 115g (including mounting plate, approx. 35g, sold separately)	
Addressing method (Addresses: between 1A (1B) and 31A (31B))			Can be done with an addressing unit (FL1HA-E) via an addressing cable (FX9Y002) connected to the addressing jack on the front of the slave. Connecting the addressing cable to a slave will disconnect the slave from the AS-i connection.	

Notes: *1 The initial value of ID1 is 7 (variable from 0 to 7).
*2 If a sensor with power consumption of more than 200mA is connected to the sensor power supply of the slave, the overload and short-circuit protective function will operate and the sensor power supply will be stopped even when 0.5ms has passed after the inrush current is generated. If a connected sensor has a high inrush current, make sure that current consumption with a lapse of 0.5 ms after the inrush current is 200 mA or less.

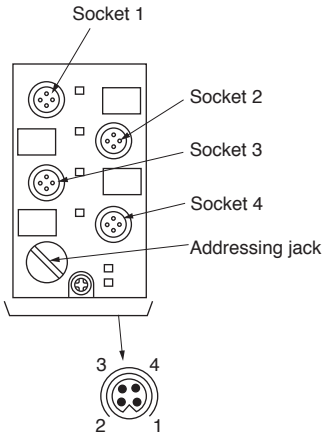
■ Connector pin assignment

NPN model

	Pin No.	FM6D1-40XXN, 40XXNCM FM6DB1-40XXN	FM6D1-04TNX	FM6DB1-03TNX	FM6D1-22TNN	Logic assignment
Socket 1	1	Sensor power supply (+)	External power supply +24V DC	External power supply +24V DC	Sensor power supply (+)	
	2	Signal input 2 (source)	Switch output 2 (sink)	Switch output 2 (sink)	Signal input 2 (source)	Data bit D1
	3	Sensor power supply (–)	Not connected	Not connected	Sensor power supply (–)	
	4	Signal input 1 (source)	Switch output 1 (sink)	Switch output 1 (sink)	Signal input 1 (source)	Data bit D0
Socket 2	1	Sensor power supply (+)	External power supply +24V DC	External power supply +24V DC	Sensor power supply (+)	
	2	Not connected	Not connected	Not connected	Not connected	
	3	Sensor power supply (–)	Not connected	Not connected	Sensor power supply (–)	
	4	Signal input 2 (source)	Switch output 2 (sink)	Switch output 2 (sink)	Signal input 2 (source)	Data bit D1
Socket 3	1	Sensor power supply (+)	External power supply +24V DC	External power supply +24V DC	External power supply +24V DC	
	2	Signal input 4 (source)	Switch output 4 (sink)	Not connected	Switch output 4 (sink)	Data bit D3
	3	Sensor power supply (–)	Not connected	Not connected	Not connected	
	4	Signal input 3 (source)	Switch output 3 (sink)	Switch output 3 (sink)	Switch output 3 (sink)	Data bit D2
Socket 4	1	Sensor power supply (+)	External power supply +24V DC	–	External power supply +24V DC	
	2	Not connected	Not connected		Not connected	
	3	Sensor power supply (–)	Not connected		Not connected	
	4	Signal input 4 (source)	Switch output 4 (sink)		Switch output 4 (sink)	Data bit D3

PNP model

	Pin No.	FM6D1-40XXP, 40XXPCM FM6DB1-40XXP	FM6D1-04TPX	FM6DB1-03TPX	FM6D1-22TPP	Logic assignment
Socket 1	1	Sensor power supply (+)	Not connected	Not connected	Sensor power supply (+)	
	2	Signal input 2 (sink)	Switch output 2 (source)	Switch output 2 (source)	Signal input 2 (sink)	Data bit D1
	3	Sensor power supply (–)	External power supply 0V	External power supply 0V	Sensor power supply (–)	
	4	Signal input 1 (sink)	Switch output 1 (source)	Switch output 1 (source)	Signal input 1 (sink)	Data bit D0
Socket 2	1	Sensor power supply (+)	Not connected	Not connected	Sensor power supply (+)	
	2	Not connected	Not connected	Not connected	Not connected	
	3	Sensor power supply (–)	External power supply 0V	External power supply 0V	Sensor power supply (–)	
	4	Signal input 2 (sink)	Switch output 2 (source)	Switch output 2 (source)	Signal input 2 (sink)	Data bit D1
Socket 3	1	Sensor power supply (+)	Not connected	Not connected	Not connected	
	2	Signal input 4 (sink)	Switch output 4 (source)	Not connected	Switch output 4 (source)	Data bit D3
	3	Sensor power supply (–)	External power supply 0V	External power supply 0V	External power supply 0V	
	4	Signal input 3 (sink)	witch output 3 (source)	witch output 3 (source)	Switch output 3 (source)	Data bit D2
Socket 4	1	Sensor power supply (+)	Not connected	–	Not connected	
	2	Not connected	Not connected		Not connected	
	3	Sensor power supply (–)	External power supply 0V		External power supply 0V	
	4	Signal input 4 (sink)	Switch output 4 (source)		Switch output 4 (source)	Data bit D3

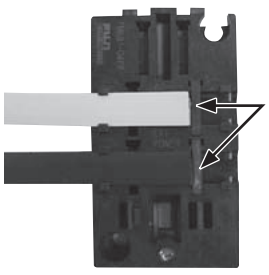


Pin No. (M12 socket)

■ Termination of AS-i cable

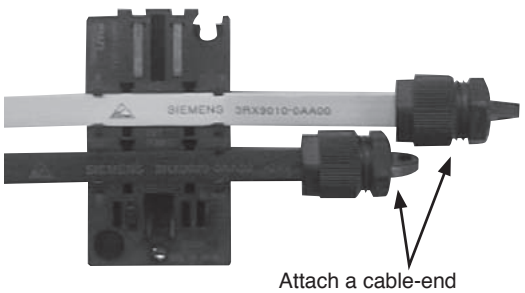
- No terminating resistors are required
- Perform any of the following actions to prevent live parts from being exposed.

Where waterproof is not required



The supplied rubber spacer is not water-resistant.

Where waterproof is required (IP65, IP67, etc.)



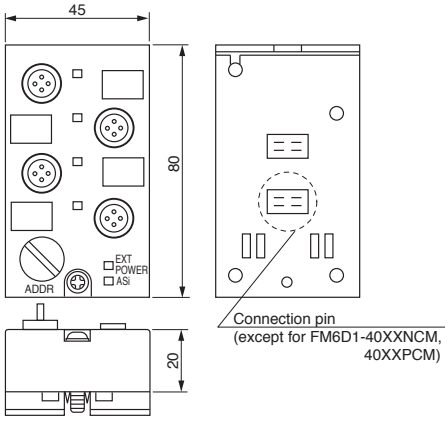
■ Precautions on wiring

- Care should be taken to avoid mis-wiring like reverse-wiring with regard to connection to external power supply (24V DC).Products might be damaged or burnt out.

■ Dimensions, mm

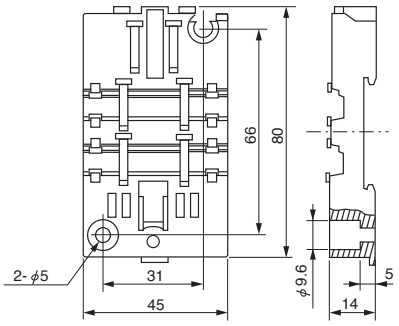
Actual slave

FM6D1-40XXN, 40XXNCM, 40XXP, 40XXPCM
FM6D1-04TNX, 04TPX, 22TNN, 22TPP
FM6DB1-40XXN, 40XXP, 03TNX, 03TPX

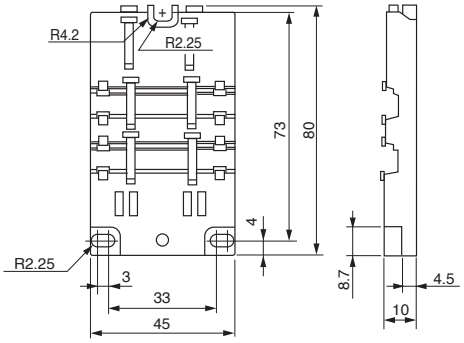


Mounting plate

Rail/screw dual mounting type
FM6B1-04FK, 04FE



Exclusive screw mounting type
FM6B2-04FK, 04FE



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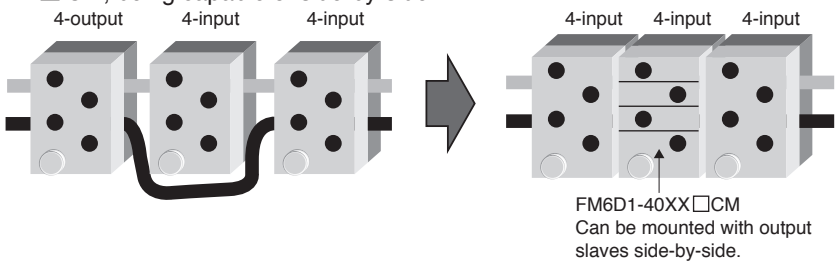
■ Mounting plate (sold separately)

Type (slave mounting plate)	Rail/screw dual mounting type	**FM6B1-04FK**	**FM6B1-04FE**
	Screw mounting type	**FM6B2-04FK**	**FM6B2-04FE**
Applicable actual slave	NPN model	**FM6D1-40XXN, 40XXNCM, FM6DB1-40XXN**	**FM6D1-04TNX, 22TNN, FM6DB1-03TNX**
	PNP model	**FM6D1-40XXP, 40XXPCM, FM6DB1-40XXP**	**FM6D1-04TPX, 22TPP, FM6DB1-03TPX**
Degree of protection (IEC 60529)		IP67	
Rated temperature		25°C	
Operating temperature range		–25 to +85°C (no icing or condensation)	
Storage temperature range		–40 to +85°C (no icing or condensation)	
Mass		Approx. 35g	

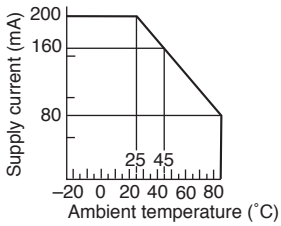
■ Advantage of side-by-side installation

Although FM6D1-40XX ☐ or FM6DB1-40XX ☐ 4-input type has a great advantage of communication cable branching, side-by-side mounting is not possible where input slaves and output slaves are positioned alternatively.
Type FM&D1-40XX ☐ CM, being capable of side-by-side mounting, helps reduce mounting space.
With abundant lineups, both branch connection and side-by-side mounting are allowed in our AS-i slaves.

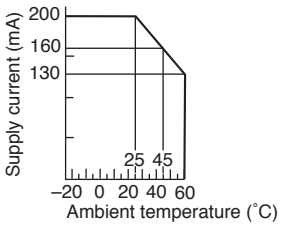


■ Current carrying capacity for all inputs (per slave)

• Standard slave

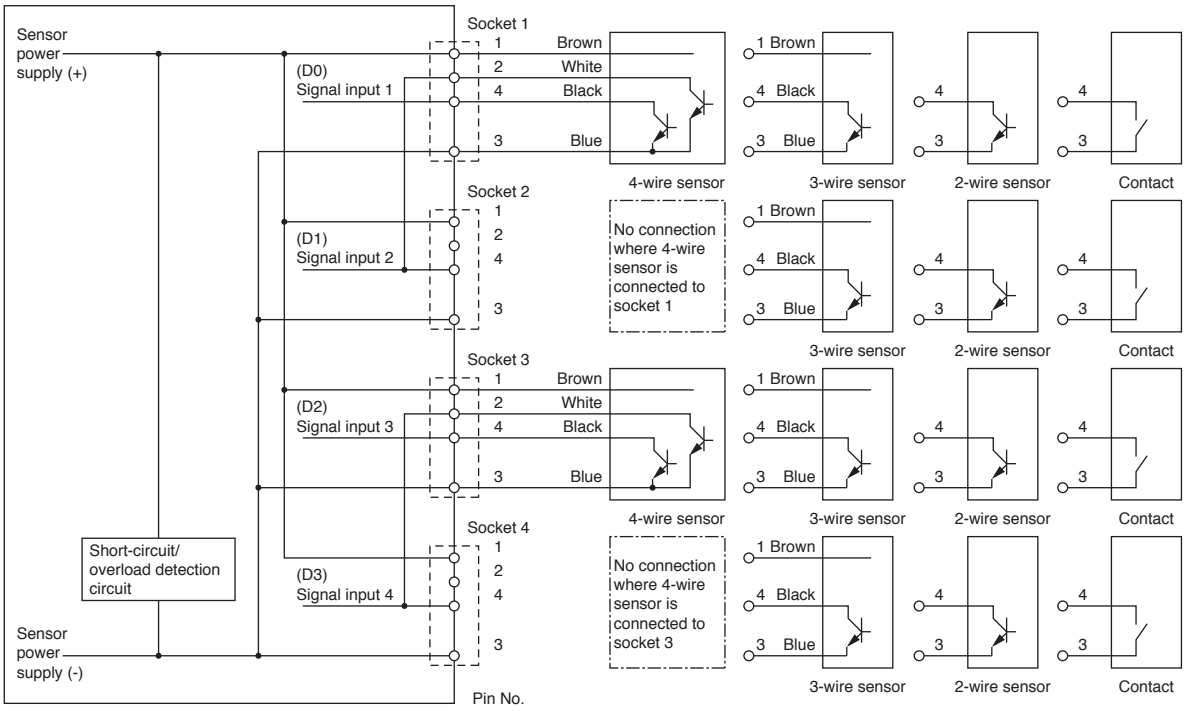


•A/B slave

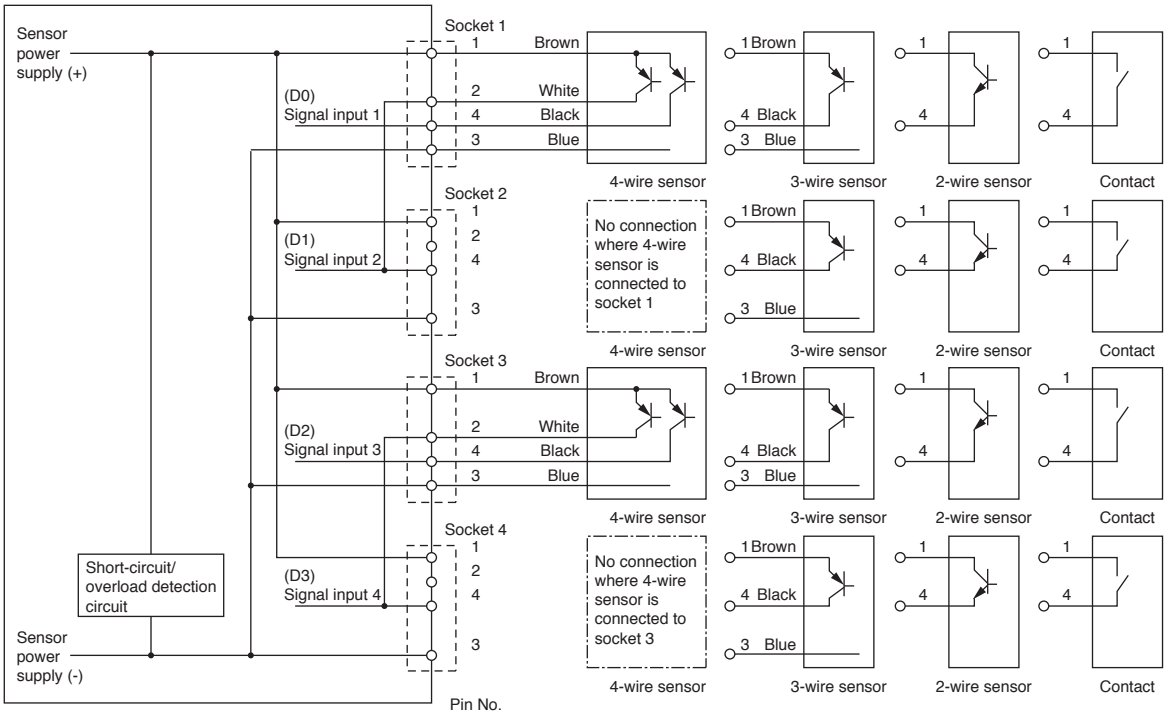


■ Wiring diagrams

FM6D1-40XXN, -40XXNCM, FM6DB1-40XXN

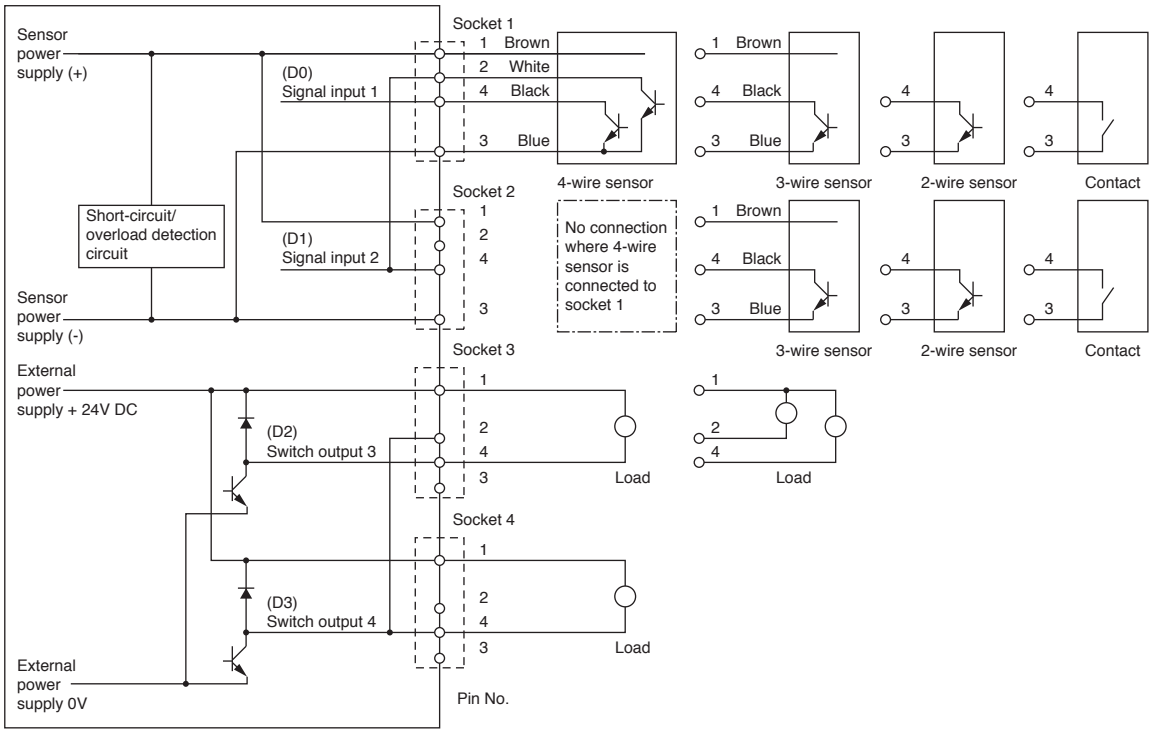


FM6D1-40XXP, -40XXPCM, FM6DB1-40XXP

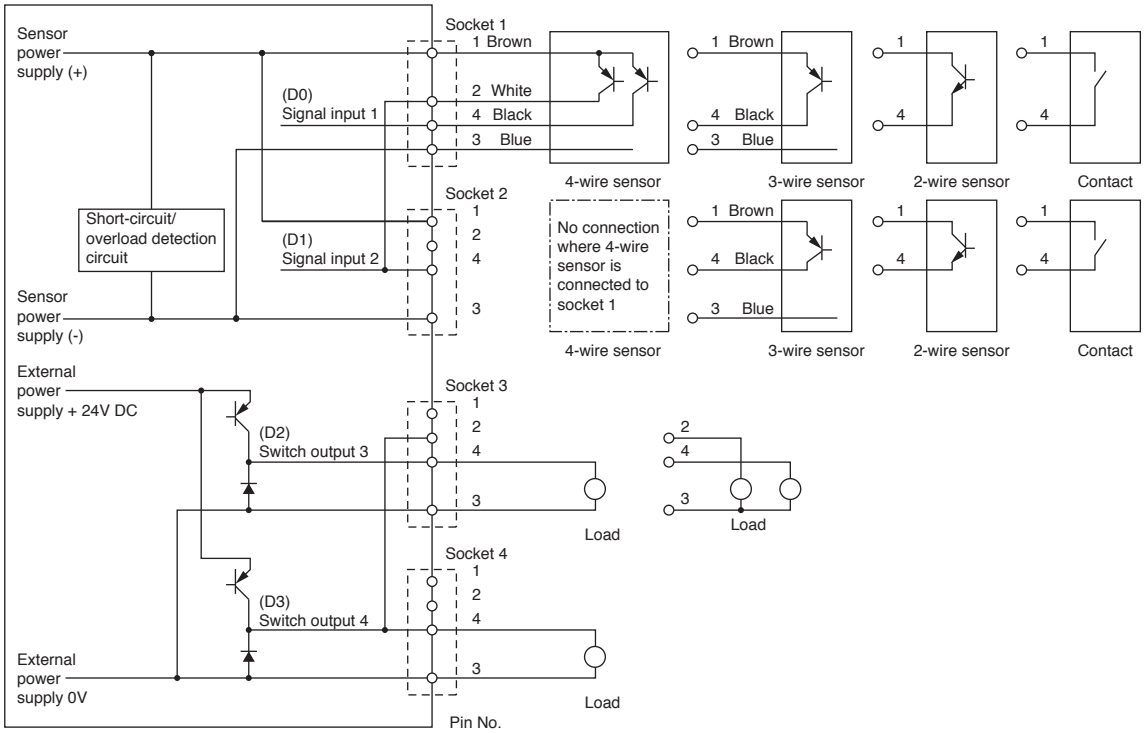


■ Wiring diagrams

FM6D1-22TNN

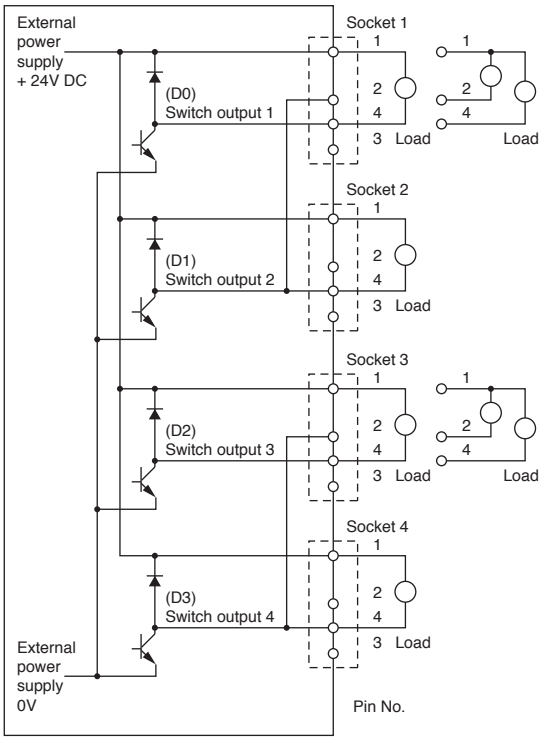


FM6D1-22TP

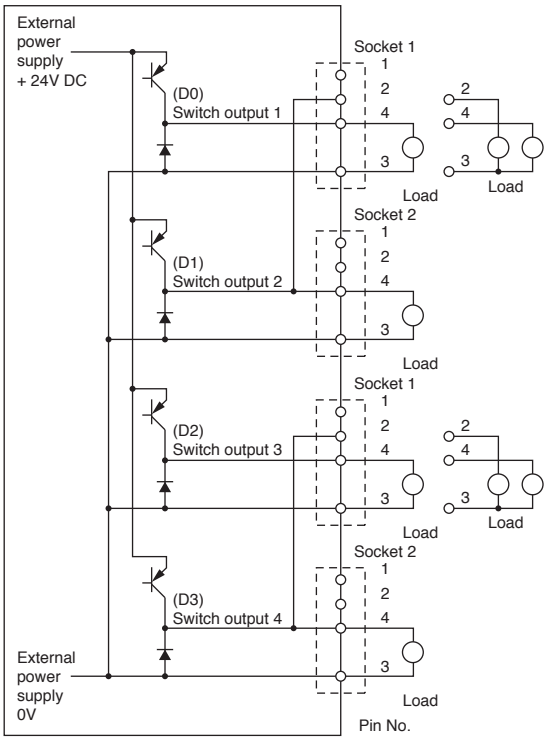


■ Wiring diagrams

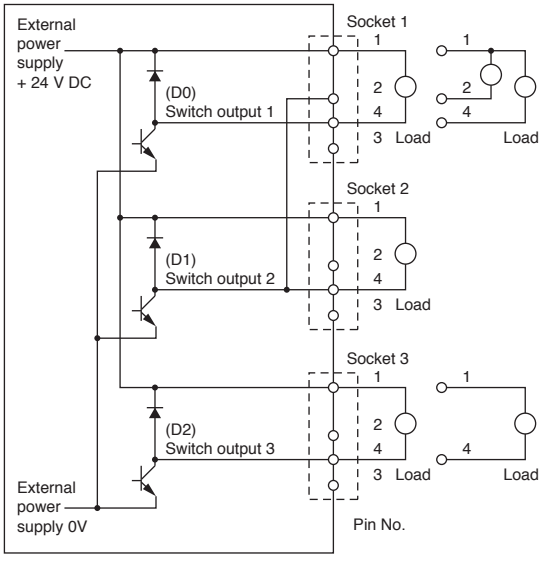
FM6D1-04TNX



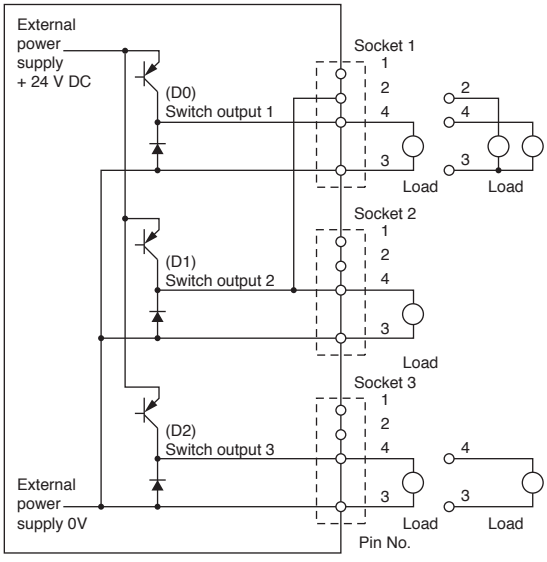
FM6D1-04TPX



FM6DB1-03TNX



FM6DB1-03TPX



Waterproof slave (Slim type), FM6D2 (Standard slave)

■ Description

The IP67 structure provides excellent environmental resistance. By allowing use outside the control panel, the FM6D2 eliminates the need for a relay box and contributes to downsizing. The FM6D2 is also more compact than conventional slaves and reduces restrictions on installation.

- Actuators and sensors can be easily connected by single-action M8 connectors (IEC 60947-5-2).
  The depth is only 30mm, which is 15mm thinner than conventional models, and the width is 25mm, which is 20mm slimmer than conventional models.
- Screw mounting in both vertical and horizontal directions.
- Short-circuit protection is provided for the sensor power supply and output circuit.
- Conforms to EC Directive
  EMC Directive (No. 89/336/EEC); EN50081-1, EN61000-6-2 (EN50082-2).
- AS-i specification: V2.0

AF01-81

FM6D2-40XXN

AF01-80

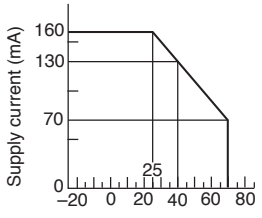
FM6D2-04TNX

■ Ratings and specifications

Type	NPN model PNP model		**FM6D2-40XXN** **FM6D2-40XXP**	**FM6D2-04TNX** **FM6D2-04TPX**	**FM6D2-22TNN** **FM6D2-22TPP**
Slave type			Standard slave		
Number of inputs/outputs			4 inputs	4 outputs	2 inputs/2 outputs
AS-Interface profile (I/O, ID)			0, 0	8, 0	3, 0
Operating voltage (in accordance. with AS-i specification)			26.5 to 31.6V DC		
Current consumption	Slave only Including sensors		45mA DC or less 205mA DC or less	45mA DC or less —	45mA DC or less 205mA DC or less
LED indication G: Green R: Red Y: Yellow	AS-i (G/R)		G on: Normal operation, R on: Communication error, R on and Orange (G+R) on alternating: Slave has address = 0, R flashing: Input power overload, Off: AS-i power off		
	EXT POWER (G)		—	On/off: 24V DC external power on/off	
	IN1 to IN4 (or 2) (Y)		On/off: Input on/off	—	On/off: Input on/off
	OUT1 to OUT4 (or 2) (Y)		—	On/off: Output on/off	On/off: Output on/off
Input	NPN	On voltage (power supply (+) - Input) Off voltage (power supply (+) - Input) On current (sorurce) Off current	10V or more 6V or less Approx. 5mA 1.5mA or less	— — — —	10V or more 6V or less Approx. 5mA 1.5mA or less
	PNP	On voltage (power supply (+) - Input) Off voltage (power supply (+) - Input) On current (sink) Off current	10V or more 6V or less Approx. 5mA 1.5mA or less	— — — —	10V or more 6V or less Approx. 5mA 1.5mA or less
Sensor power supply via black AS-i cable	Short-circuit and overload protection Sensor voltage range Current carrying capacity for all inputs *		Built-in 20 to 27V (I ≦ 160mA) 160mA (Ta ≦ 25˚C) 130mA (Ta = 40˚C) 70mA (Ta = 70˚C)	— — —	Built-in 20 to 27V (I ≦ 160mA) 160mA (Ta ≦ 25˚C) 130mA (Ta = 40˚C) 70mA (Ta = 70˚C)
Output	External power supply 24V DC		—	Via M12 connector	
	Range of operating voltage		—	20 to 30V DC	
	NPN model PNP model		— —	NPN transistor PNP transistor	
	Current carrying capacity, per point Voltage drop Short-circuit protection Inductive surge protection Output status on communication error		— — — — —	Approx. 0.5A 0.8V or less Built-in Built-in Off	Approx. 0.5A 0.8V or less Built-in Built-in Off
Degree of protection (IEC 60529)			IP67 (with M12 and M8 connectors)		
Rated temperature			25˚C		
Operating temperature			–25 to +70˚C (no icing or no condensation)		
Storage temperature			–25 to +85˚C (no icing or no condensation)		
Supply method of external power			—	Supplied by M12 socket	
Electrical protection for AS-i connection	Reverse polarity protection		Built-in		
	Electrostatic discharge resistance		Contact discharge method: ±4kV, Aerial discharge method: ±8kV, IEC61000-4-2 (Class B)		
	Electromagnetic field noise immunity		80 to 1000MHz, Electric field strength: 10V/m, IEC61000-4-3 (Class A)		
	Burst noise		2kV (Class B)/1kV (Class A), IEC61000-4-4		
Vibration resistance	Screw mounting (IEC 68-2-6)		10 to 55Hz, 1mm one-way amplitude		
Shock resistance	Screw mounting (IEC 68-2-27)		300m/s^2 (18ms)		
CE marking	Low Voltage Directive (No.: 73/23/EEC) EMC Directive (No.: 89/336/EEC)		— EN50081-1, EN61000-6-2 (EN50082-2)		
Mounting method			Screw mounting		
Mass			Approx. 70g		
Addressing method			15 times, After the 15th address, the slave keeps the last address (in accordance with slave ASIC (SAP4.0) specifications).		
Approval			CE		

Note: * If a sensor with power consumption of more than 200mA is connected to the sensor power supply of the slave, the overload and short-circuit protective function will operate and the sensor power supply will be stopped even when 0.5ms has passed after the inrush current is generated. If a connected sensor has a high inrush current, make sure that current consumption with a lapse of 0.5 ms after the inrush current is 200 mA or less.

Current carrying capacity for all inputs



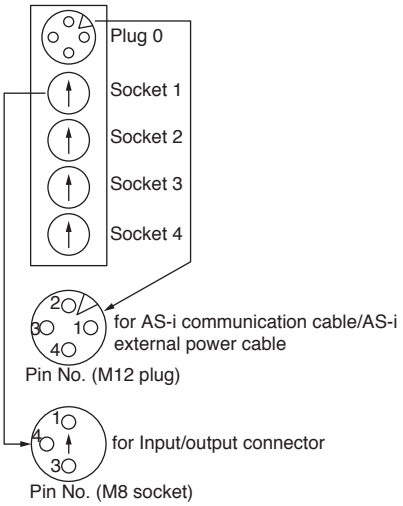
■ Connector pin assignment

NPN model

	Pin No.	FM6D2-40XXN	FM6D2-04TNX	FM6D2-22TNN	Logic assignment
Socket 0	1	AS-i (+)	AS-i (+)	AS-i (+)	
	2	Not connected	External power supply 0V	External power supply 0V	
	3	AS-i (–)	AS-i (–)	AS-i (–)	
	4	Not connected	External power supply +24V DC	External power supply +24V DC	
Socket 1	1	Sensor power supply (+)	External power supply +24V DC	Sensor power supply (+)	
	3	Sensor power supply (–)	Not connected	Sensor power supply (–)	
	4	Signal input 1 (source)	Switch output 1 (sink)	Signal input 1 (source)	Data bit D0
Socket 2	1	Sensor power supply (+)	External power supply +24V DC	Sensor power supply (+)	
	3	Sensor power supply (–)	Not connected	Sensor power supply (–)	
	4	Signal input 2 (source)	Switch output 2 (sink)	Signal input 2 (source)	Data bit D1
Socket 3	1	Sensor power supply (+)	External power supply +24V DC	External power supply +24V DC	
	3	Sensor power supply (–)	Not connected	Not connected	
	4	Signal input 3 (source)	Switch output 3 (sink)	Switch output 3 (sink)	Data bit D2
Socket 4	1	Sensor power supply (+)	External power supply +24V DC	External power supply +24V DC	
	3	Sensor power supply (–)	Not connected	Not connected	
	4	Signal input 4 (source)	Switch output 4 (sink)	Switch output 4 (sink)	Data bit D3

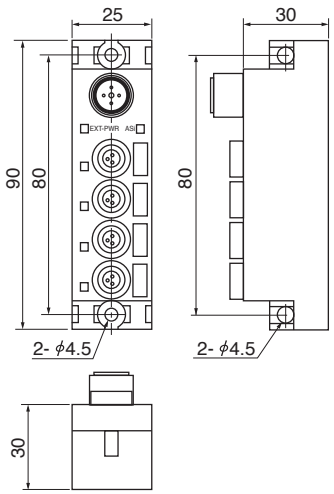
PNP model

	Pin No.	FM6D2-40XXP	FM6D2-04TPX	FM6D2-22TPP	Logic assignment
Socket 0	1	AS-i (+)	AS-i (+)	AS-i (+)	
	2	Not connected	External power supply 0V	External power supply 0V	
	3	AS-i (–)	AS-i (–)	AS-i (–)	
	4	Not connected	External power supply +24V DC	External power supply +24V DC	
Socket 1	1	Sensor power supply (+)	Not connected	Sensor power supply (+)	
	3	Sensor power supply (–)	External power supply 0V	Sensor power supply (–)	
	4	Signal input 1 (sink)	Switch output 1 (source)	Signal input 1 (sink)	Data bit D0
Socket 2	1	Sensor power supply (+)	Not connected	Sensor power supply (+)	
	3	Sensor power supply (–)	External power supply 0V	Sensor power supply (–)	
	4	Signal input 2 (sink)	Switch output 2 (source)	Signal input 2 (sink)	Data bit D1
Socket 3	1	Sensor power supply (+)	Not connected	Not connected	
	3	Sensor power supply (–)	External power supply 0V	External power supply 0V	
	4	Signal input 3 (sink)	Switch output 3 (source)	Switch output 3 (source)	Data bit D2
Socket 4	1	Sensor power supply (+)	Not connected	Not connected	
	3	Sensor power supply (–)	External power supply 0V	External power supply 0V	
	4	Signal input 4 (sink)	Switch output 4 (source)	Switch output 4 (source)	Data bit D3



■ Dimensions, mm

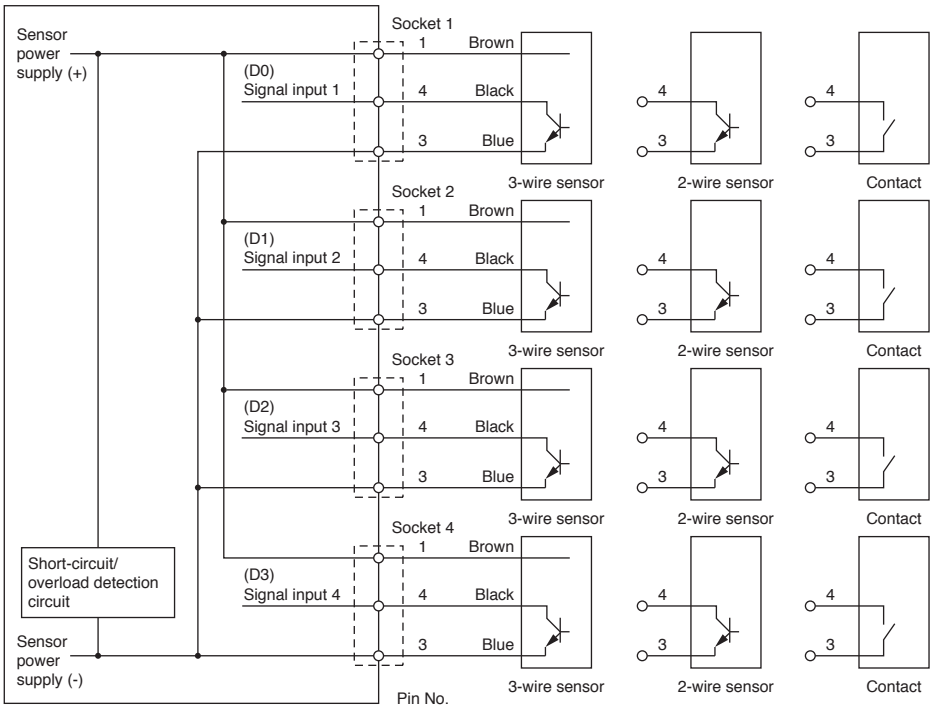
FM6D2-40XXN, 04TNX, 22TNN
FM6D2-40XXP, 04TPX, 22TPP



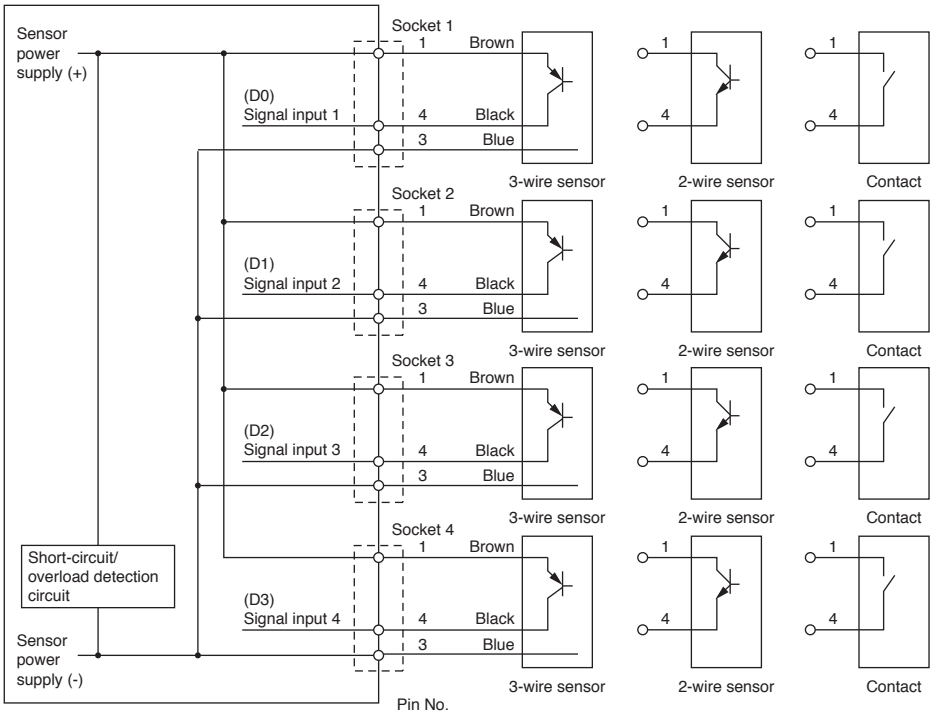
* For connecting AS-i cable, use the SAC-4P-M12MS relaying cable (page 05/92) to be inserted to the socket 0 (M12).

■ Wiring diagrams

FM6D2-40XXN

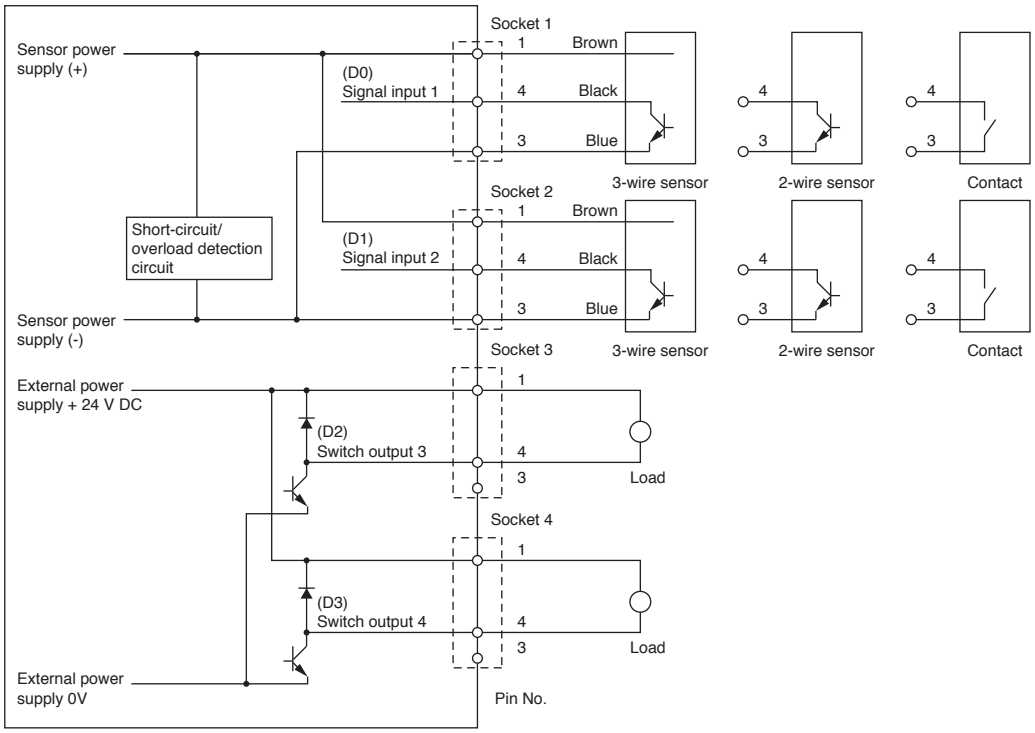


FM6D2-40XXP

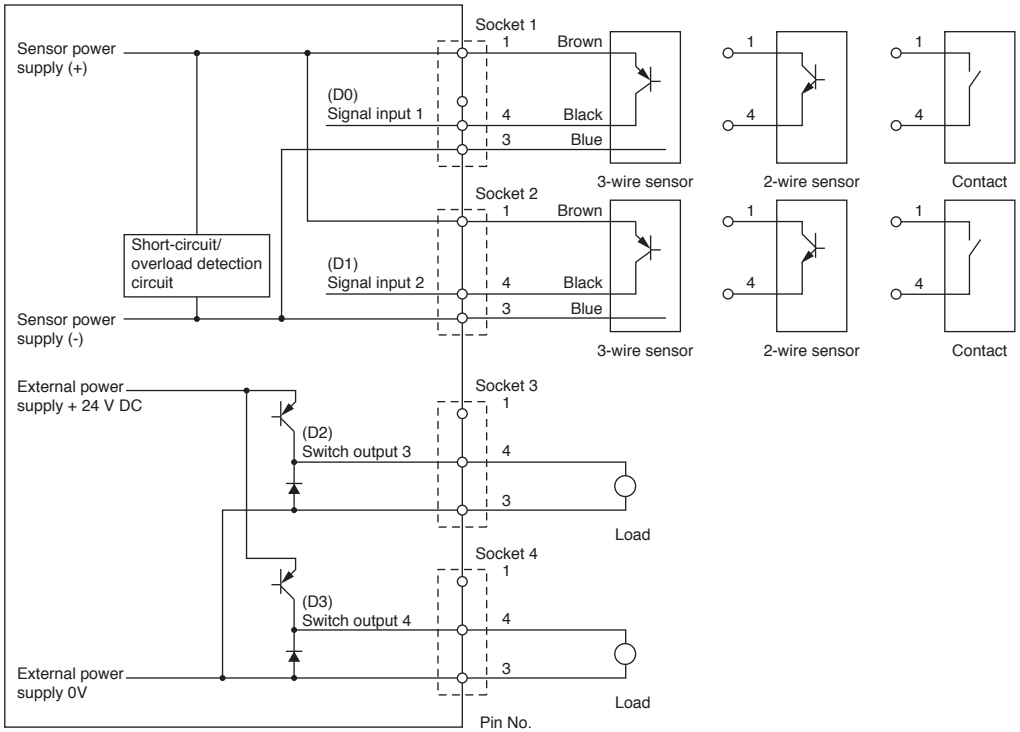


■ Wiring diagrams

FM6D2-22TNN



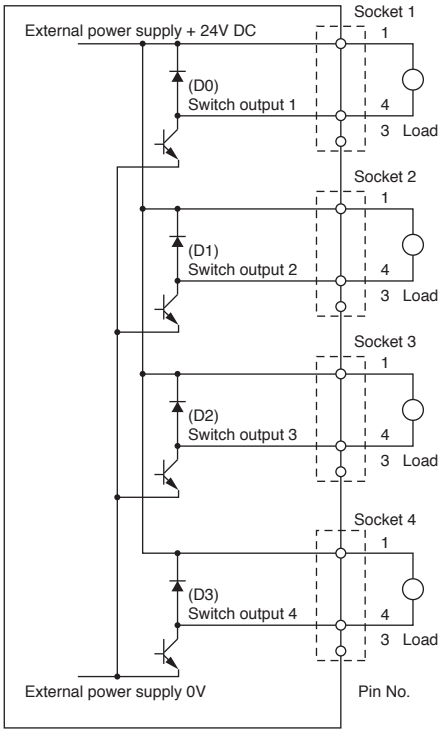
FM6D2-22TPP



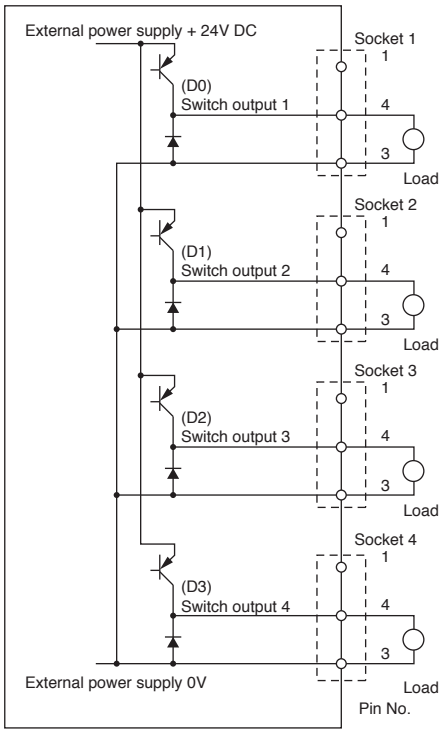
05

■ Wiring diagrams

FM6D2-04TNX

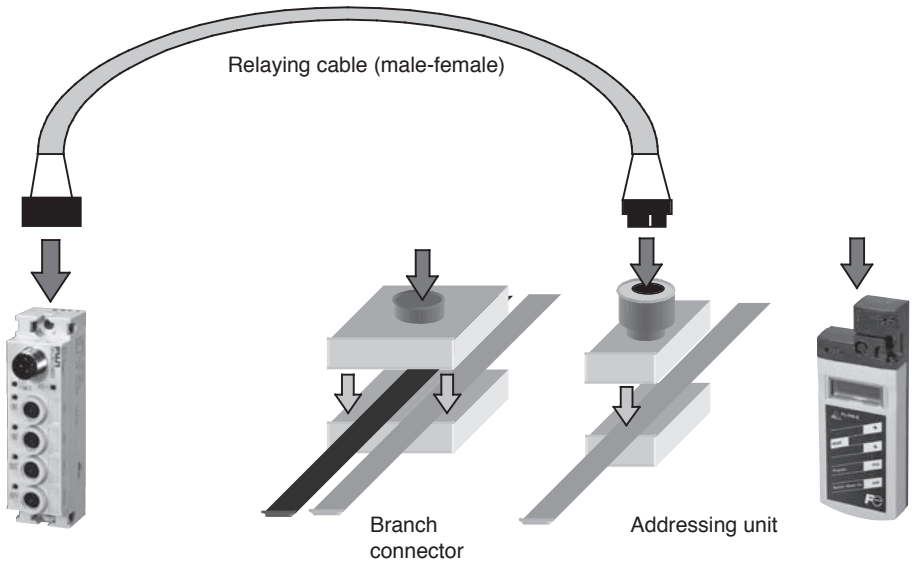


FM6D2-04TPX



■ Precautions on wiring

- Care should be taken to avoid mis-wiring like reverse-wiring with regard to connection to external power supply (24V DC). Products might be damaged or burnt out.
- Connection with external devices
  A relaying cable or the like are necessary as shown below to connect with this slave.
  For details, refer to the User's Manual, "Construction Process" No. FEH705.



Analog slave, FM6A

KK104-004

Actual slave
FM6A31-02

AF01-78

Mounting plate
FM6B1-04FK

■ Description

The FM6A is an analog slave that complies with the AS-Interface specification: Ver. 2.1 (Slave profile: S7.3).

- The FM6A is a flat and compact slave which is provided with 2 channels, similar to FM6D1.
- Mounting plates are available in two types :IEC rail/screw dual mounting and exclusive screw mounting.
- The actual slave can be easily fixed to the mounting plate using one screw.
- Actuators and sensors can be easily connected by single-action M12 connectors (IEC60947-5-2).
- AS-i specification: V2.1

■ Ratings and specifications

Type		**FM6A11-20 FM6A21-20**	**FM6A51-20**	**FM6A31-02**	**FM6A41-02**
Slave type		Analog slave			
AS-i power	Operating voltage (in accordance with AS-i specification)	26.5 to 31.6V DC			
	Current consumption	Max. 50mA			
External power	Operating voltage	24V DC (21.6 to 30V DC)			
	Current consumption	Max. 25mA + sensor supply current	Max. 25mA	Max. 40mA + output load current	Max. 35mA + output load current
LED indication G: Green R: Red	AS-i FAULT(G/R)	G on: Normal operation, R on: Communication error R on and Orange (G+R) on alternating: Slave has address=0 R and G alternating on: Peripheral fault, R flashing: Hardware major fault, Off: Power off			
	EXT POWER(G)	On/off: 24V auxiliary power on/off			
Degree of protection (IEC 60529)		IP67			
Reference temperature		25˚C			
Operating temperature Storage temperature		–20 to 60˚C (no icing or no condensation) –25 to 85˚C (no icing or no condensation)			
Supply of method external power		Via mounting plate			
Electrical protection for AS-i connection	Reverse polarity protection	Built-in			
	Electrostatic discharge resistance	Contact discharge method: ±4kV Aerial discharge method: ±8kV, IEC 61000-4-2 (Class B)			
	Electromagnetic field noise immunity	80 to 1000MHz, Electric field strength:10V/m, IEC 61000-4-3 (Class A)			
	Burst noise	2kV (Class B) / 1kV (Class A), IEC 61000-4-4			
Vibration resistance	Rail mounting(IEC 68-2-6) Screw mounting(IEC 68-2-6)	10 to 55Hz, 0.5mm one-way amplitude 10 to 55Hz, 1mm one-way amplitude			
Shock resistance	Rail mounting(IEC 68-2-27) Screw mounting(IEC 68-2-27)	150m/s^2 (11ms) 300m/s^2 (18ms)			
Mass		Approx. 120g (including mounting plate: Approx. 35g)			
Addressing method		Can be done with an addressing unit (FL1HA-E) via an addressing cable (FX9Y002) connected to the addressing jack on the front of the slave. Connecting the addressing cable to a slave will disconnect the slave from the AS-i connection.			
Approval		CE			

■ Ratings and specifications

Input slave

Type (actual slave)	**FM6A11-20**	**FM6A21-20**	**FM6A51-20**
Mounting plate (sold separately)	**FM6B1-04FE** (Rail/screw dual mounting type) **FM6B2-04FE** (Screw mounting type)		
AS-Interface profile (I/O, ID, ID2)	7, 3, D		
Number of channel	2		
Input range (changed by a parameter.)	4 to 20mA 0 to 20mA	0 to 10V 1 to 5V	Pt100: –200 to +850˚C JPt100: –200 to +500˚C
Input impedance	250Ω	100kΩ	—
Current tolerance	Max. 40mA	—	—
Voltage tolerance	—	±25V	—
Supply to external sensor	Max. 500mA (total of 2 channels)		—
Resolution	16bit (0.49μA)	16bit (0.245mV)	16bit
Overall accuracy (for full scale)	±0.2% (25˚C)		
wiring	4-wire(differential) / 2-wire	4-wire(differential)	4-wire

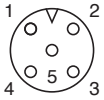
Output slave

Type (actual slave)	**FM6A31-02**	**FM6A41-02**
Mounting plate (sold separately)	**FM6B1-04FE** (Rail/screw dual mounting type) **FM6B2-04FE** (Screw mounting type)	
AS-Interface profile (I/O, ID, ID2)	7, 3, 5	
Number of channel	2	
Output range (changed by a parameter.)	4 to 20mA 0 to 20mA	0 to 10V 1 to 5V
Load impedance	Max. 500Ω (Max. 0.1mH)	Min. 1kΩ (Max. 0.1μF)
Output current	Max. 24mA	—
Output voltage	—	Max. 12V
Resolution	12bit (6μA)	12bit (3mV)
Overall accuracy (for full scale)	±0.5% (–20 to 60˚C)	
Wiring	2-wire	2-wire

■ Wirings

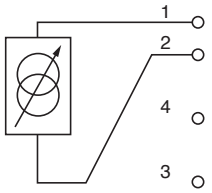
Current input slave
FM6A11-20

Pin assignment
1: L +24V
2: IN+
3: GND
4: IN–
5: N.C.



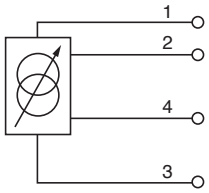
2-wire sensor

Parameter setting
for 2-wire connection



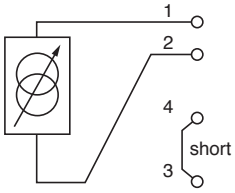
4-wire sensor

Supply from
analog slave



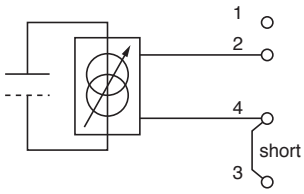
2-wire sensor

Parameter setting
for 4-wire connection



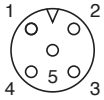
4-wire sensor

Supply from
external power supply



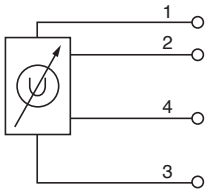
Voltage input slave
FM6A21-20

Pin assignment
1: L +24V
2: IN+
3: GND
4: IN–
5: N.C.



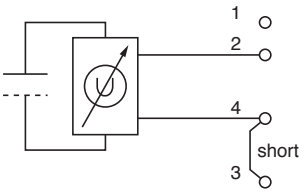
4-wire sensor

Supply from
analog slave



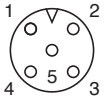
4-wire sensor

Supply from
external power supply

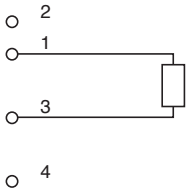


Current output slave
FM6A31-02

Pin assignment
1: OUT
2: N.C.
3: GND
4: N.C.
5: N.C.

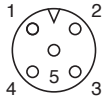


Wiring

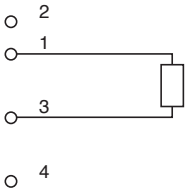


Voltage output slave
FM6A41-02

Pin assignment
1: OUT
2: N.C.
3: GND
4: N.C.
5: N.C.



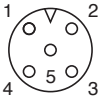
Wiring



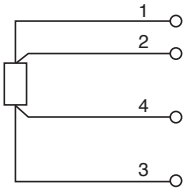
Resistance temperature sensor input slave

FM6A51-20

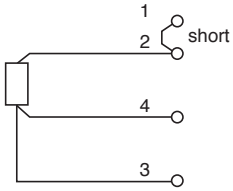
Pin assignment
1: Iconst+
2: IN+
3: Iconst–
4: IN–
5: N.C.



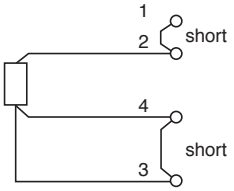
4-wire sensor



3-wire sensor



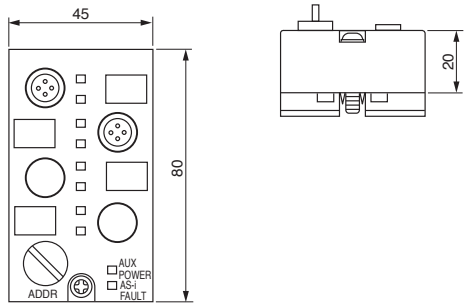
2-wire sensor



■ Dimensions mm

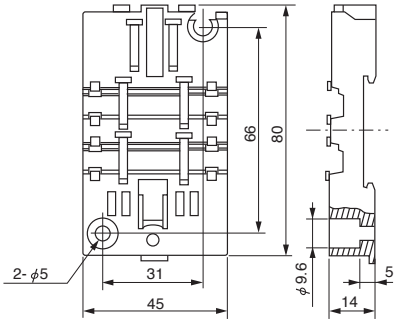
Actual slave

FM6A11-20, FM6A21-20
FM6A51-20
FM6A31-02, FM6A41-02

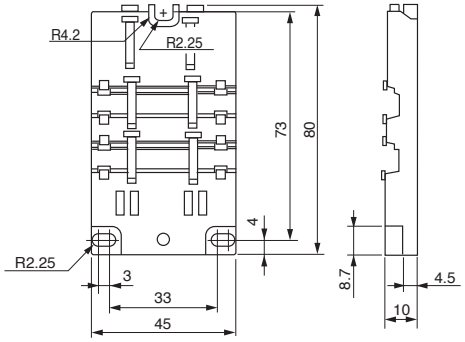


Mounting plate

Rail/screw dual mounting type
FM6B1-04FE

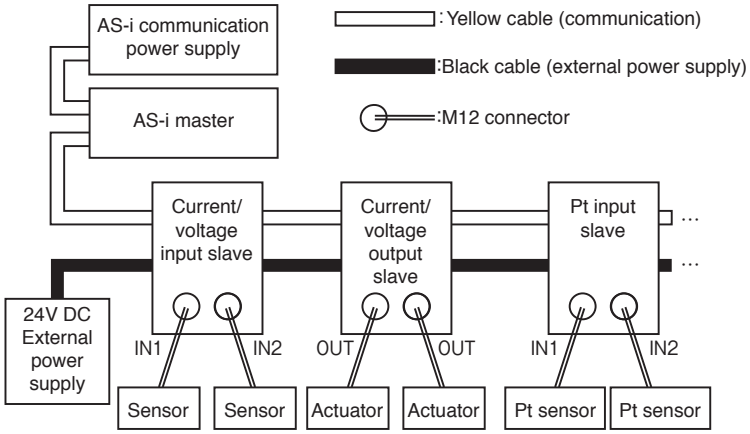


Screw mounting type
FM6B2-04FE



■ Connection configuration

- The connection between this slave and AS-i cable (yellow cable and black cable) employs insulation piercing connection.



External power supply is essential to use this slave.
Care shall be taken to avoid miswiring like reverse wiring.

■ Termination of AS-i cable

- No terminating resistors are reguired.
- For live parts exposure prevention, hide the AS-i cable end, inserting the rubber spacer supplied with the mounting plate.

■ Precaution on wiring

- Care should be taken to avoid miswiring like reverse wiring with regard to connection to external power supply (24V DC). Products might be damaged or burnt out.
- The analog processor in this slave operates by 24V DC external power supply. Excess noise to external power supply may affect the accuracy. Connect the external power cable to the external power supply separately installed from noise generating devices.

■ Cautions on connecting external power supply

If voltage output type slaves or current output type slaves are kept supplied with external power supply, not connected with AS-i power supply, erroneous output prevention circuit in analog slave will be activated, thus, a short-circuit in the internal output circuit may result.
Turn on and off the AS-i power supply and external power supply simultaneously. Failure may result.

Dustproof slave (Flat type), FM4D/FM4DB

■ Description

The slave inclueds an actual slave and a top section which is the slave cover. The IP40 (except aux. terminal-block) structure shuts out dust to provide excellent environmental resistance. By allowing use outside the control panel, in locations that do not require water resistance, the slave eliminates the need for relay boxes and contributes to downsizing.

- Flat, compact slaves can be installed in virtually any location.
- The slave can be easily connected to the AS-i flat cable by insulation piercing connection.
- Short-circuit protection and overload protection are provided for the sensor power supply.
- Actuators and sensors can be easily connected by single-action insulation displacement connectors.
- The 24V DC sensor power is supplied from the AS-i flat cable.
- The slave is addressed with an addressing jack located on the side of the slave.
- AS-i specification: V2.0, V2.1

KK01-265A

FM4D-40XXN

KK01-265A

FM4DB-40XXN

05

■ Ratings and specifications

Type	NPN model PNP model		**FM4D-40XXN** **FM4D-40XXP**	**FM4D-04TNX** **—**	**FM4D-22TNN** **FM4D-22TPP**
Slave type			Standard slave		
Number of inputs/outputs			4 inputs	4 outputs	2 inputs/2 outputs
AS-Interface profile (I/O, ID)			0, 0	8, 0	3, 0
Operating voltage (in accordance. with AS-i specification)			26.5 to 31.6V DC		
Current consumption	Slave only Including sensors		45mA DC or less 245mA DC or less	45mA DC or less —	45mA DC or less 245mA DC or less
LED indication G: Green R: Red Y: Yellow	AS-i (G/R)		G on: Normal operation, R on and Orange (G+R) on alternating: Slave has address = 0, R on: Communication error, R flashing: Input power overload, Off: AS-i power off		
	IN1 to IN4 (or 2) (Y)		On/off: Input on/off	—	On/off: Input on/off
	OUT1 to OUT4 (or 2) (Y)		—	On/off: output on/off	On/off: output on/off
Input	NPN	On voltage (Power supply (+) - Input)	10V or more	—	10V or more
		Off voltage (Power supply (+) - Input)	6V or less	—	6V or less
		On current (sorurce)	Approx. 5mA	—	Approx. 5mA
		Off current	1.5mA or less	—	1.5mA or less
	PNP	On voltage (Power supply (+) - Input)	10V or more	—	10V or more
		Off voltage (Power supply (+) - Input)	6V or less	—	6V or less
		On current (sink)	Approx. 5mA	—	Approx. 5mA
		Off current	1.5mA or less	—	1.5mA or less
Sensor power supply via AS-i cable	Short-circuit and overload protection		Built-in	—	Built-in
	Sensor voltage range		20 to 26.5V (I ≦ 160mA) 18 to 26.5V (I ≦ 200mA)	—	20 to 26.5V (I ≦ 160mA) 18 to 26.5V (I ≦ 200mA)
	Current carrying capacity for all inputs		200mA (Ta ≦ 25˚C) 160mA (Ta = 45˚C) 110mA (Ta = 70˚C)	—	200mA (Ta ≦ 25˚C) 160mA (Ta = 45˚C) 110mA (Ta = 70˚C)
Output *	External power supply 24V DC		—	Via black AS-i flat cable	Via black AS-i flat cable
	Operating voltage range		—	20 to 30V DC	20 to 30V DC
	NPN model PNP model		— —	NPN transistor —	NPN transistor PNP transistor
	Current carrying capacity, per point		—	Max. 200mA	Max. 200mA
	Voltage drop		—	1.5V or less	1.5V or less
	Inductive surge protection		—	Built-in	Built-in
	Output status on communication error		—	Off	Off
Operating temperature			–25 to +70˚C (no icing or no condensation)		
Storage temperature			–25 to +85˚C (no icing or no condensation)		
Relative humidity			35 to 85% RH (no condensation)		
Electrical protection for AS-i connection	Reverse polarity protection		Built-in		
	Electrostatic discharge resistance		Contact discharge method: ±4kV, Aerial discharge method: ±8kV, IEC 61000-4-2 (Class A)		
	Electromagnetic field noise immunity		80 to 1000MHz, Electric field strength: 10V/m, IEC 61000-4-3 (Class A)		
	Burst noise		2kV (Class B)/1kV (Class A), IEC 61000-4-4		
Vibration resistance	Screw mounting (IEC 68-2-6)		10 to 55Hz, double amplitude 1.5mm for 2 hours in each direction of X, Y, Z		
Shock resistance	Screw mounting (IEC 68-2-27)		500m/s^2 for 3 times in each direction of X, Y, Z		
Degree of protection (IEC 60529)			IP40 (excluding terminal section)		
Mass			Approx. 60g		
Addressing method (Addresses: between 1 and 31)			Can be made with an addressing unit (FL1HA-E) via addressing cable (FX9Y002) connected to the addressing jack on the side of the slave. Connecting the addressing cable to a slave will disconnect the slave from the AS-Interface.		
Approval			CE		

Note: * Short-circuit protection is not built-in.

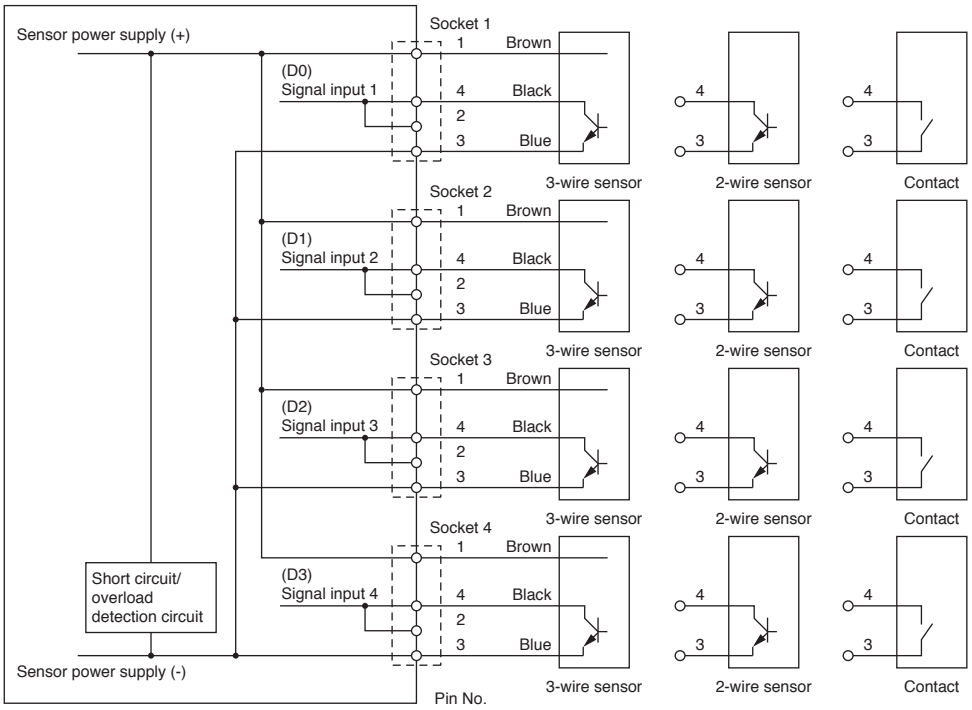
■ Ratings and specifications

Type	NPN model		FM4DB-40XXN	FM4DB-03TNX
Slave type			A/B slave	
Number of inputs/outputs			4 inputs	3 outputs
AS-Interface profile (I/O, ID, ID2) *1			0, A, 0	8, A, 0
Operating voltage (in accordance. with AS-i specification)			26.5 to 31.6V DC	
Current consumption	Slave only		45mA DC or less	45mA DC or less
	Including sensors		245mA DC or less	—
LED indication G: Green R: Red Y: Yellow	AS-i (G/R)		G on: Power on, R on and Orange (G+R) on alternating: Slave has address = 0, R on: Communication error, R flashing: Input power overload, Off: AS-i power off	
	IN1 to IN4 (Y)		On/off: input on/off	—
	OUT1 to OUT3 (Y)		—	On/off: output on/off
Input	NPN	On voltage (Power supply (+) - Input)	10V or more	—
		Off voltage (Power supply (+) - Input)	6V or less	—
		On current (sorurce)	Approx. 5mA	—
		Off current	1.5mA or less	—
Sensor power supply via AS-i cable	Short-circuit and overload protection		Built-in	—
	Sensor voltage range		20 to 26.5V (I ≦ 160mA)	—
			18 to 26.5V (I ≦ 200mA)	
	Current carrying capacity for all inputs		200mA (Ta ≦ 25˚C)	—
			160mA (Ta = 45˚C)	
			130mA (Ta = 60˚C)	
Output *2	External power supply 24V DC		—	Via black AS-i flat cable
	Operating voltage range		—	20 to 30V DC
	NPN model		—	NPN transistor
	Current carrying capacity, per point		—	Max. 200mA
	Voltage drop		—	1.5V or less
	Inductive surge protection		—	Built-in
	Output status on communication error		—	Off
Degree of protection (IEC60529)			IP40 (except terminal section)	
Operating temperature			–25 to +60˚C (no icing or no condensation)	
Storage temperature			–25 to +85˚C (no icing or no condensation)	
Relative humidity			35 to 85% RH (no condensation)	
Supply method of external power			—	via external power supply terminal
Electrical protection for AS-i connection	Reverse polarity protection		Built-in	
	Electrostatic discharge resistance		Contact discharge method: ±4kV, Aerial discharge method: ±8kV, IEC 61000-4-2 (Class A)	
	Electromagnetic field noise immunity		80 to 1000MHz, Electric field strength: 10V/m, IEC 61000-4-3 (Class A)	
	Burst noise		2kV (Class B)/1kV (Class A), IEC 61000-4-4	
Vibration resistance	Screw mounting (IEC 68-2-6)		10 to 55Hz, double amplitude 1.5mm for 2 hours in each direction of X, Y, Z	
Shock resistance	Screw mounting (IEC 68-2-27)		500m/s^2 for 3 times in each direction of X, Y, Z	
Mass			Approx. 60g	
Addressing method (Addresses: between 1A (1B) and 31A (31B))			Can be made with an addressing unit (FL1HA-E) via addressing cable (FX9Y002) connected to the addressing jack on the side of the slave. Connecting the addressing cable to a slave will disconnect the slave from the AS-Interface.	
Approval			CE	

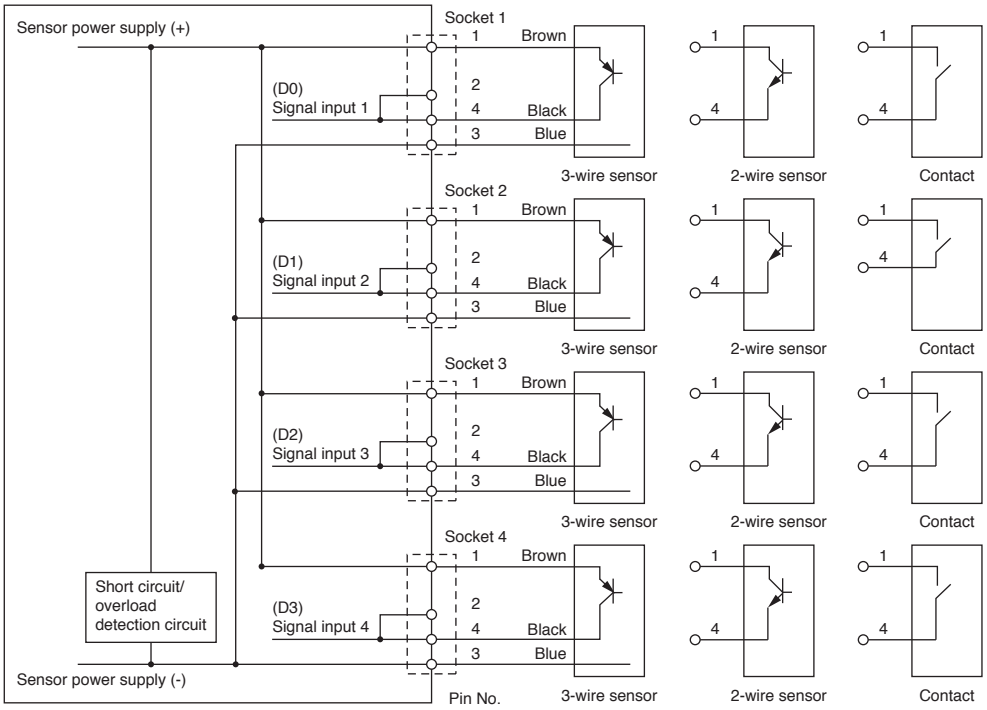
Notes: *1 The initial value of ID1 is 7 (variable from 0 to 7).
*2 Short-circuit protection is not built-in.

■ Wiring diagrams

FM4D-40XXN, FM4DB-40XXN

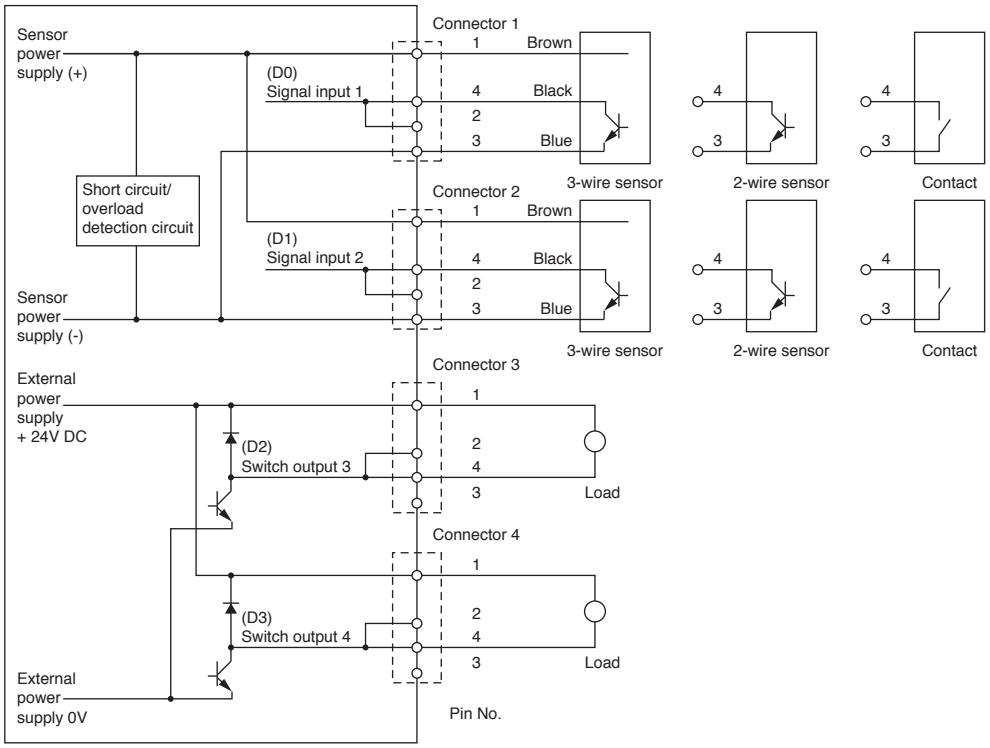


FM4D-40XXP

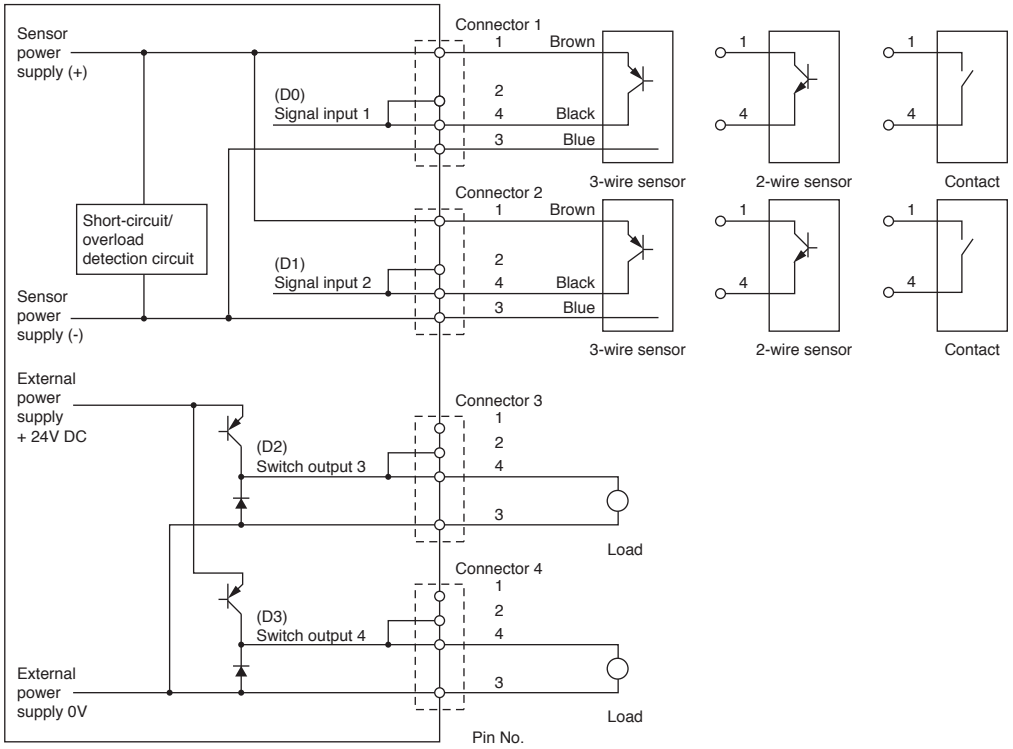


■ Wiring diagrams

FM4D-22TNN

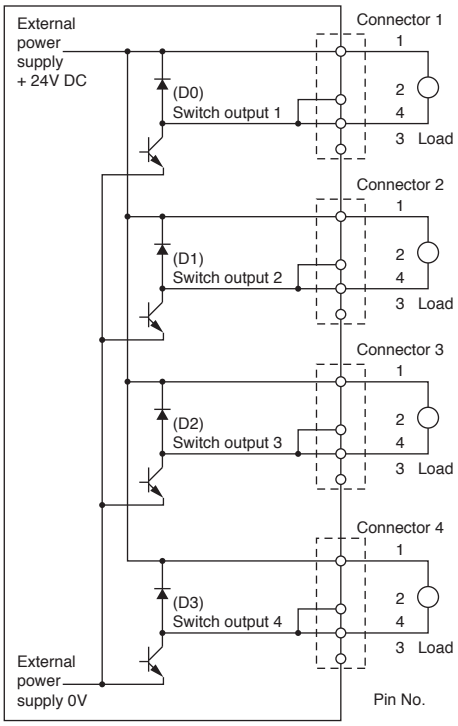


FM4D-22TPP

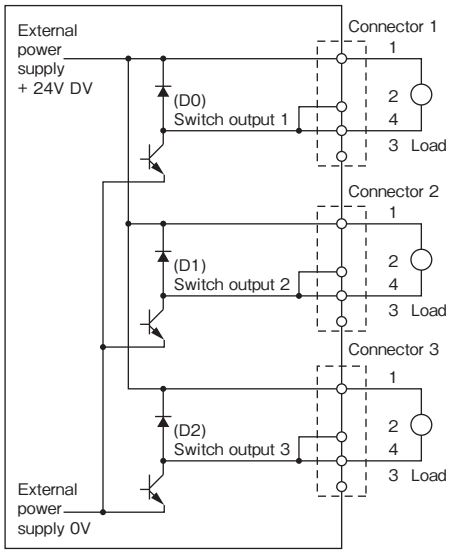


■ Wiring diagrams

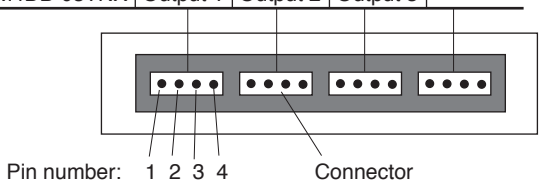
FM4D-04TNX



FM4DB-03TNX



Data bit	D0	D1	D2	D3
FM4D-40XX□	Input 1	Input 2	Input 3	Input 4
FM4D-22T□□	Input 1	Input 2	Output 1	Output 2
FM4D-04TNX	Output 1	Output 2	Output 3	Output 4
FM4DB-40XXN	Input 1	Input 2	Input 3	Input 4
FM4DB-03TNX	Output 1	Output 2	Output 3	–

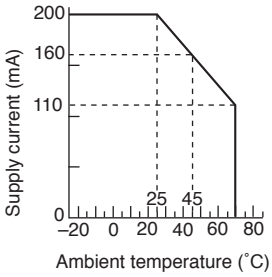


Applicable connector
- Manufacturer: Honda Tsushin Kogyo Co., Ltd.
- Type: QZ-61-H4SFUT1, T3 (applicable wire size: 0.08 to 0.2mm^2)
- Type: QZ-61-H4SFUT2, T4 (applicable wire size: 0.3mm^2)

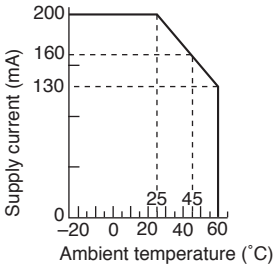
See page 05/92, "Connectors for dustproof slaves."

■ Current carrying capacity for all input (per slave)

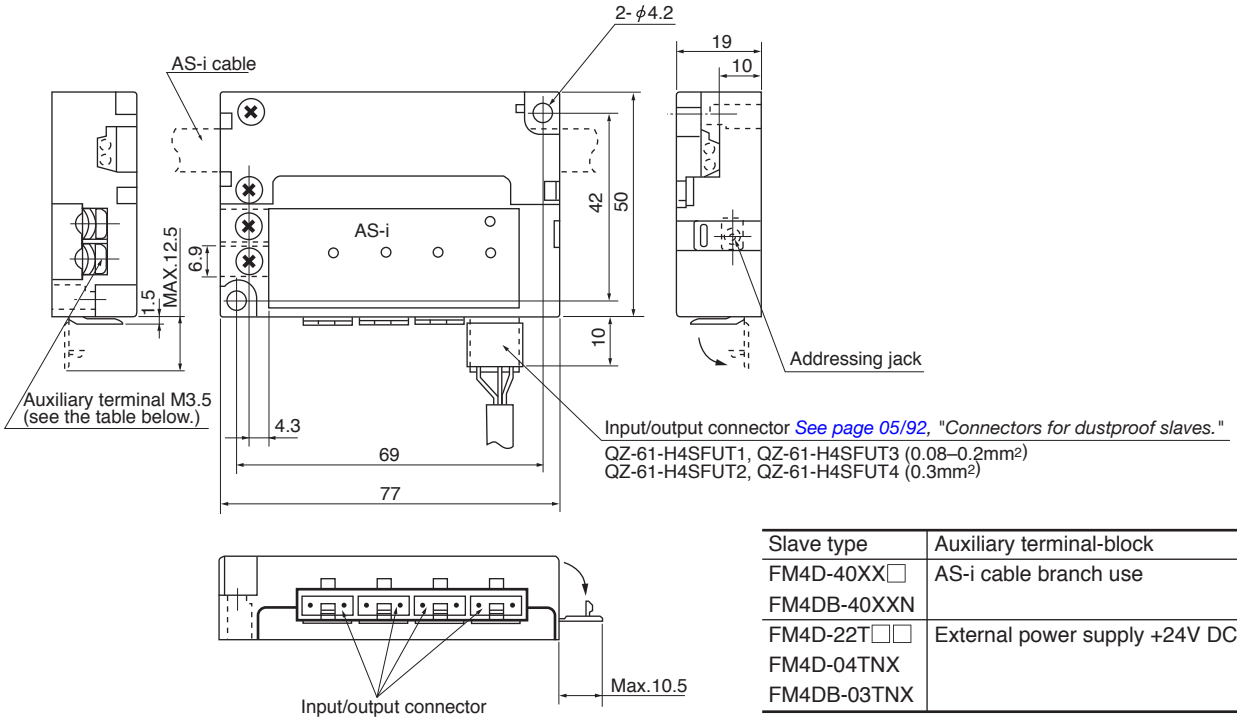
• Standard slave



• A/B slave

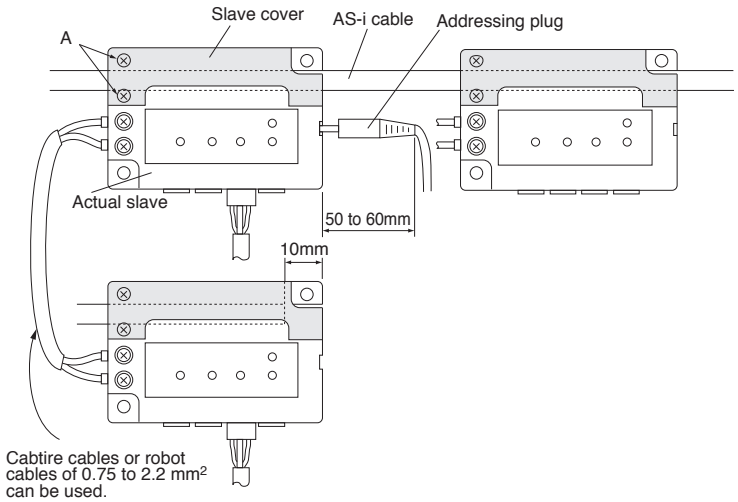


■ Dimensions, mm



Slave type	Auxiliary terminal-block
FM4D-40XX□	AS-i cable branch use
FM4DB-40XXN	
FM4D-22T□□	External power supply +24V DC use
FM4D-04TNX	
FM4DB-03TNX	

■ Precautions on installation and wiring



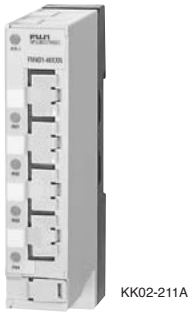
- To connect the AS-i cable, tighten the screws (marked A) until the slave cover and actual slave fit together completely. Operating the slave with the cover and actual slave not completely fit may result in poor contact.
- To connect the FM4D-22T□□, FM4D-04TNX or FM4DB-03TNX to output devices for load control, connect the +24V DC external power supply to the auxiliary terminal. The auxiliary terminal of the FM4D-40XX□ or FM4DB-40XXN is for use with the AS-i cable branch terminal. Do not connect an external power supply to it.
- If a sensor with power consumption of more than 200mA is connected to the sensor power supply of the slave, the overload and short-circuit protective function will operate and the sensor power supply will be stopped even when 0.5ms has passed after the inrush current is generated. If a connected sensor has a high inrush current, make sure that current consumption with a lapse of 0.5 ms after the inrush current is 200 mA or less.

Dustproof slave (Slim type), FM4D1/FM4DB1

■ Description

While offering excellent IP40 environmental resistance, the slave minimizes installation space with its vertical mounting configuration. By using the desired number of slaves closely mounted, empty I/Os can be reduced and installation space greatly decreased in comparison with the use of I/O units.

- The slim 17.5mm width contributes to space saving.
- The mounting plates are IEC rail/screw dual mounting type.
- The slave can be easily connected to the AS-Interface flat cables by insulation piercing connection.
- Short-circuit protection and overload protection are provided for the sensor power supply.
- Actuators and sensors can be easily connected by single-action insulation displacement connectors.
- The 24V DC sensor power is supplied from the AS-i flat cable.
- The slave is addressed with an addressing jack located on the front of the slave.
- AS-i specification: V2.0, V2.1


KK02-211A

FM4D1-40XXN

KK04-006

FM4DB1-40XXN

■ Ratings and specifications

Type	NPN model	FM4D1-40XXN	FM4D1-04TNX
Slave type		Standard slave	
Number of inputs/outputs		4 inputs (NPN)	4 outputs (NPN)
AS-Interface profile (I/O, ID)		0, 0	8, 0
Operating voltage (in accordance. with AS-i specification)		26.5 to 31.6V DC	
Current consumption	Slave only	45mA DC or less	45mA DC or less
	Including sensors	205mA DC or less	—
LED indication	AS-i (G/R)	G on: Power on, R on and Orange (G+R) on alternating: Slave has address = 0,	
G: Green		R on: Communication error, R flashing: Input power overload, Off: AS-i power off	
R: Red	External power supply (G)	—	On: External power supply on
Y: Yellow	IN1 to IN4 (Y)	On/off: Input on/off	—
	OUT1 to OUT4 (Y)	—	On/off: Output on/off
Input	On Voltage (Power supply (+) - Input)	10V or more	—
	Off voltage (Power supply (+) - Input)	6V or less	—
	On current (sorurce)	Approx. 5mA	—
	Off current	1.5mA or less	—
Sensor power supply (per slave)	Short-circuit and overload protection	Built-in	—
	Sensor voltage range	20 to 27V (I ≦ 160mA)	—
	Current carrying capacity for all inputs	160mA (Ta ≦ 25˚C)	—
		130mA (Ta = 45˚C)	
		107.5mA (Ta = 60˚C)	
Output *	External power supply 24V DC	—	Via black AS-i flat cable
	Operating voltage range	—	20 to 30V DC
	Type of output	—	NPN transistor
	Current carrying capacity	—	200mA per point
	Voltage drop	—	1.5V or less
	Inductive surge protection	—	Built-in
	Output status on communication error	—	Off
Degree of protection (IEC60529)		IP40 (with connectors' and jack's hinges closed)	
Reference temperature		25˚C	
Operating temperature		–25 to +60˚C (no icing or no condensation)	
Storage temperature		–25 to +85˚C (no icing or no condensation)	
Relative humidity		35 to 85% RH (no condensation)	
Electrical protection for AS-i	Reverse polarity protection	Built-in	
	Electrostatic discharge resistance	Contact discharge method: ±4kV, Aerial discharge method: ±8kV, IEC61000-4-2 (Class A)	
	Electromagnetic field noise immunity	80 to 1000MHz, Electric field strength: 10V/m, IEC61000-4-3 (Class A)	
	Burst noise	2kV (Class B) /1kV (Class A), IEC61000-4-4	
Vibration resistance	Rail mounting (IEC 68-2-6)	10 to 55Hz, 0.5mm one-way amplitude	
	Screw mounting (IEC 68-2-6)	10 to 55Hz, 1mm one-way amplitude	
Shock resistance	Rail mounting (IEC 68-2-27)	150m/s^2 (11ms)	
	Screw mounting (IEC 68-2-27)	300m/s^2 (18ms)	
Mass		Approx. 60g (including mounting plate)	
Addressing method (Addresses: between 1 and 31)		Can be done with an addressing unit (FL1HA-E) via an addressing cable (FX9Y002) connected to the addressing jack on the slave front. Connecting the addressing cable to a slave will disconnect the slave from the AS-Interface.	
Approval		CE	

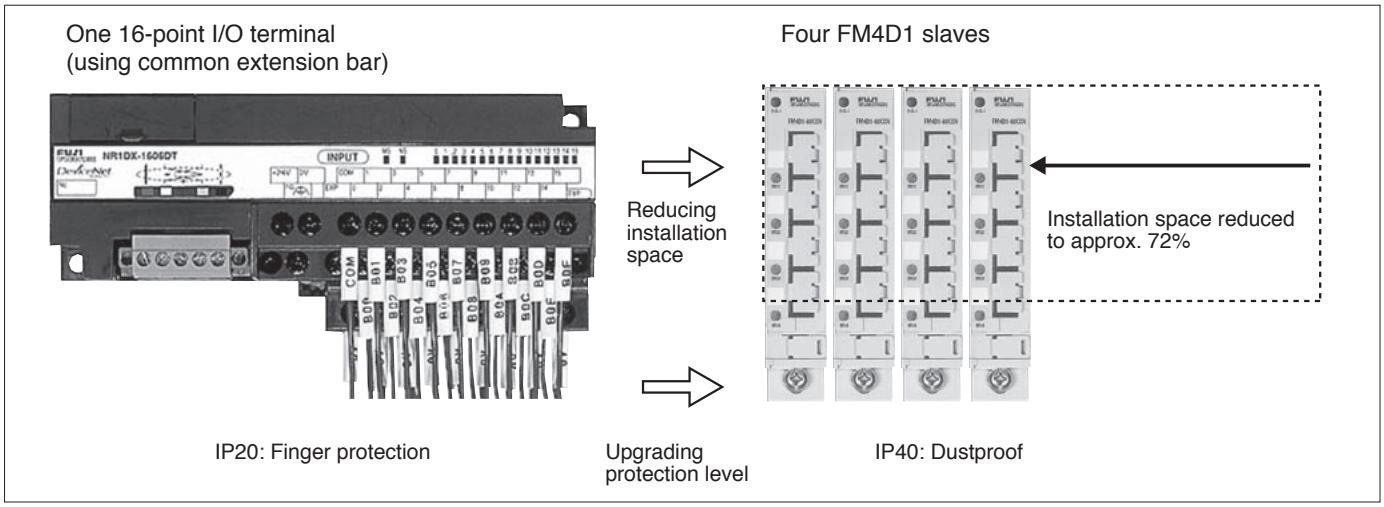
Note: *Short-cuicuit protection is not built-in.

■ Ratings and specifications

Type	NPN model	FM4DB1-40XXN	FM4DB1-03TNX
Slave type		A/B slave	
Number of inputs/outputs		4 inputs (NPN)	3 outputs (NPN)
AS-Interface profile (I/O, ID, ID2) [*1]		0, A, 0	8, A, 0
Operating voltage (in accordance. with AS-i specification)		26.5 to 31.6V DC	
Current consumption	Slave only	45mA DC or less	45mA DC or less
	Including sensors	205mA DC or less	—
LED indication G: Green R: Red Y: Yellow	AS-i (G/R)	G on: Power on, R on and Orange (G+R) on alternating: Slave has address = 0, R on: Communication error, R flashing: Input power overload, Off: AS-i power off	
	IN1 to IN4 (Y)	On/off: Input on/off	—
	OUT1 to OUT3 (Y)	—	On/off: Output on/off
Input	On voltage (Power supply (+) - Input)	10V or more	—
	Off voltage (Power supply (+) - Input)	6V or less	—
	On current (sorurce)	Approx. 5mA	—
	Off current	1.5mA or less	—
Sensor power supply (per slave)	Short-circuit and overload protection	Built-in	—
	Sensor voltage range	20 to 27V (I ≦ 160mA)	—
	Current carrying capacity for all inputs	160mA (Ta ≦ 25˚C) 130mA (Ta = 45˚C) 107.5mA (Ta = 60˚C)	—
Output [*2]	External power supply 24V DC	—	Via black AS-i flat cable
	Range of operating voltage	—	20 to 30V DC
	Type of output	—	NPN transistor
	Current carrying capacity, per point	—	Max. 200mA
	Voltage drop	—	1.5V or less
	Inductive surge protection	—	Built-in
	Output status on communication error	—	Off
Degree of protection (IEC60529)		IP40 (with connectors' and jack's hinges closed)	
Reference temperature		25˚C	
Operating temperature		–25 to +60˚C (no icing or no condensation)	
Storage temperature		–25 to +85˚C (no icing or no condensation)	
Relative humidity		35 to 85% RH (no condensation)	
Electrical protection for AS-i	Reverse polarity protection	Built-in	
	Electrostatic discharge resistance	Contact discharge method: ±4kV, Aerial discharge method: ±8kV, IEC61000-4-2 (Class A)	
	Electromagnetic field noise immunity	80 to 1000MHz, Electric field strength: 10V/m, IEC61000-4-3 (Class A)	
	Burst noise	2kV (Class B) /1kV (Class A), IEC61000-4-4	
Vibration resistance	Rail mounting (IEC 68-2-6)	10 to 55Hz, 0.5mm one-way amplitude	
	Screw mounting (IEC 68-2-6)	10 to 55Hz, 1mm one-way amplitude	
Shock resistance	Rail mounting (IEC 68-2-27)	150m/s^2 (11ms)	
	Screw mounting (IEC 68-2-27)	300m/s^2 (18ms)	
Mass		Approx. 60g (including mounting plate)	
Addressing method (Addresses: between 1 and 31)		Can be done with an addressing unit (FL1HA-E) via an addressing cable (FX9Y002) connected to the addressing jack on the slave front. Connecting the addressing cable to a slave will disconnect the slave from the AS-Interface.	
Approval		CE	

Notes: [*1] The initial value of ID1 is 7 (variable from 0 to 7).
[*2] Short-cuicuit protection is not built-in.

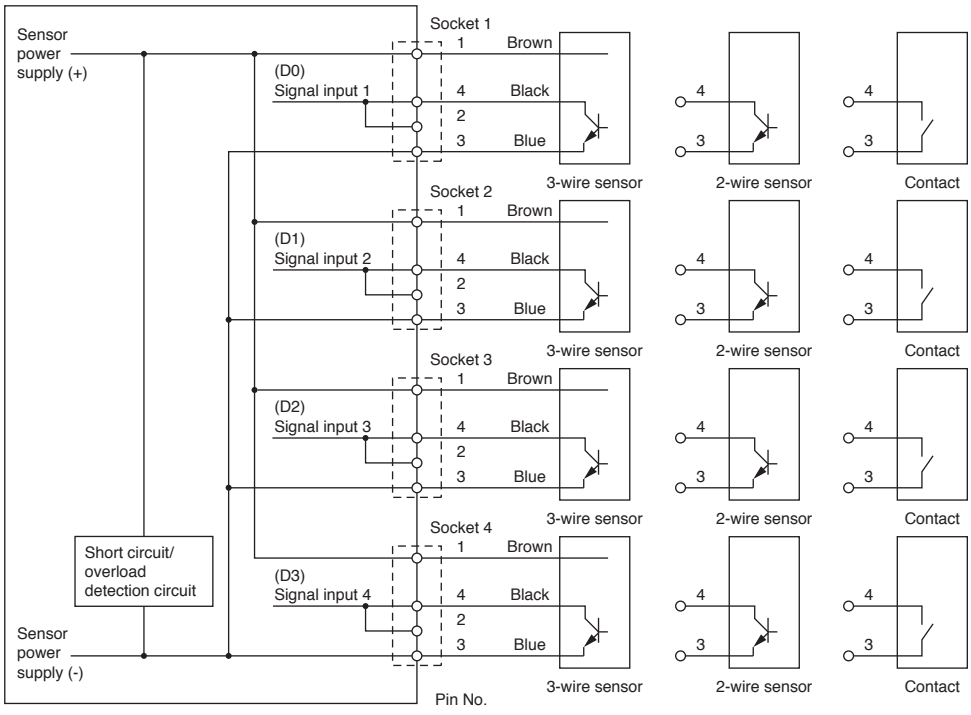
■ Great space-saving effect



Use 3-wire type sensors for further space-saving.

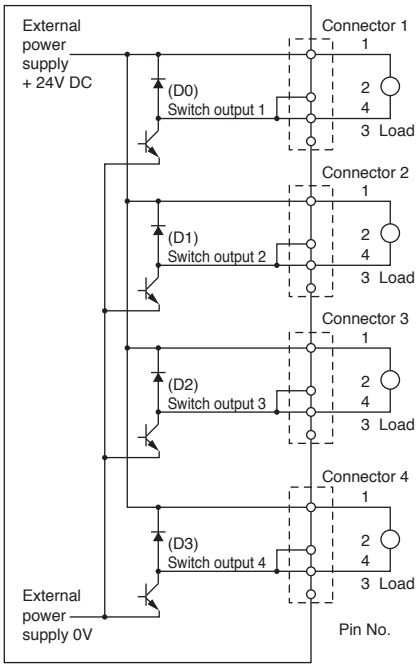
■ Wiring diagrams

FM4D1-40XXN, FM4DB1-40XXN

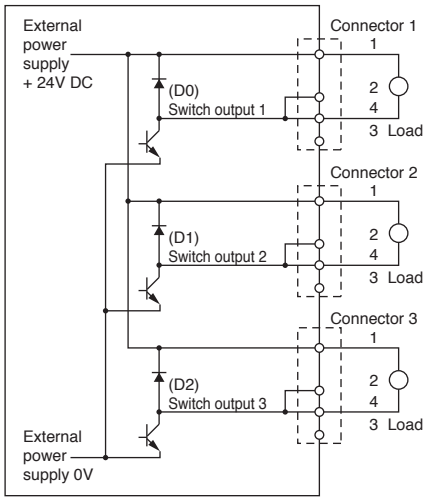


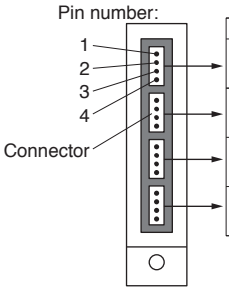
■ Wiring diagrams

FM4D1-04TNX



FM4DB1-03TNX





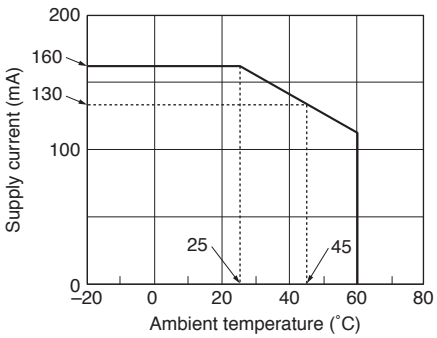
FM4D1-40XXN	FM4D1-04TNX	FM4DB1-40XXN	FM4DB1-03TNX	Data bit
Input 1	Output 1	Input 1	Output 1	D0
Input 2	Output 2	Input 2	Output 2	D1
Input 3	Output 3	Input 3	Output 3	D2
Input 4	Output 4	Input 4	–	D3

Where 2-wire DC sensor is used
- Unnecessary to connect to No. 1 pin. Connect brown wire to No. 2 or No. 4 pin.
- The leakage current should be 1.5mA or less

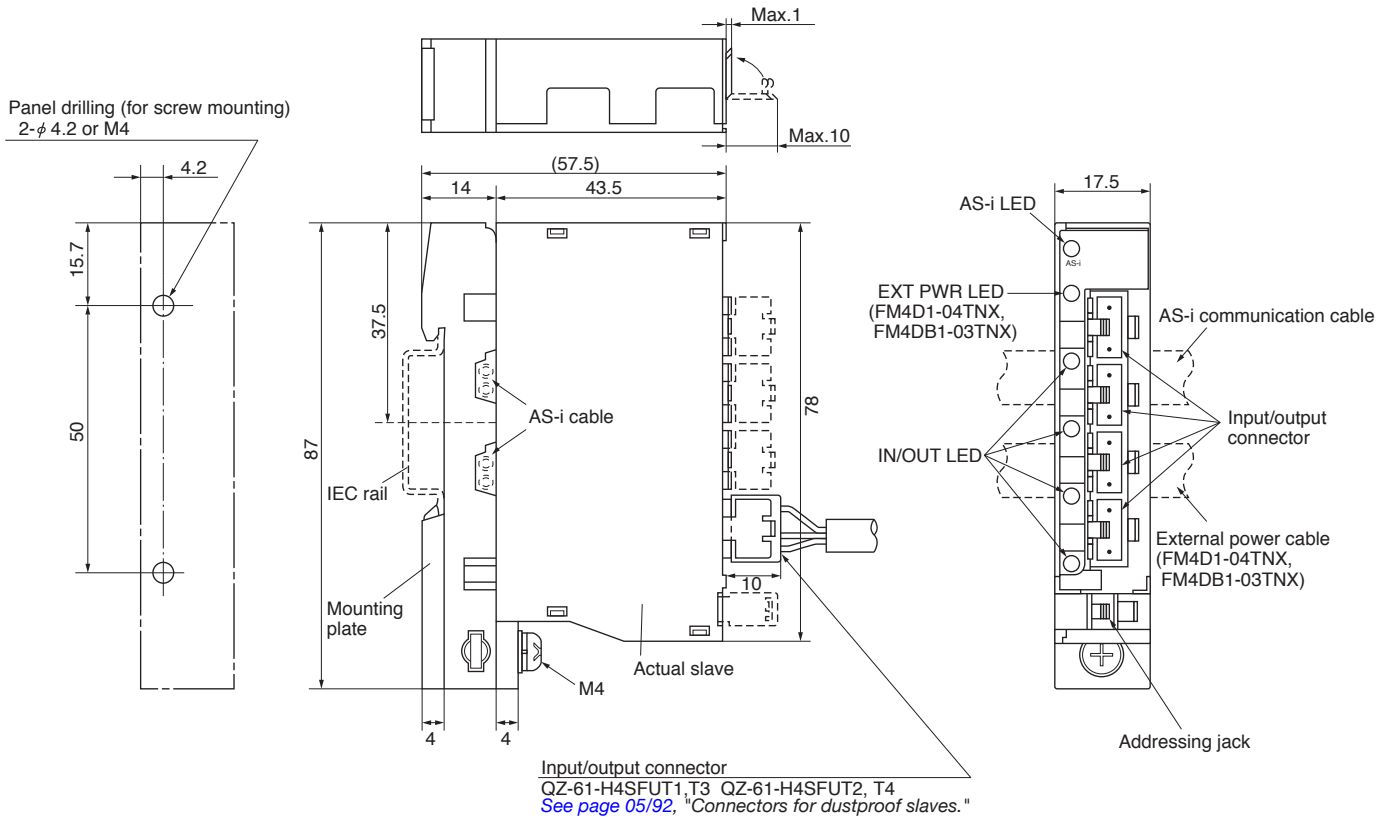
Applicable connector (applicable wire size)
- Manufacturer: Honda Tsushin Kogyo Co., Ltd.
- Type: QZ-61-H4SFUT1, T3 (0.08 to 0.2mm^2)
- Type: QZ-61-H4SFUT2, T4 (0.3mm^2)

See page 05/92, "*Connectors for dustproof slaves.*"

■ Current carrying capacity for al inputs (per slave)



■ Dimensions, mm



■ Precautions on installation and wiring

- If a sensor with power consumption of more than 200mA is connected to the sensor power supply of the slave, the overload and short-circuit protective function will operate and the sensor power supply will be stopped even when 0.5ms has passed after the inrush current is generated. If a connected sensor has a high inrush current, make sure that current consumption with a lapse of 0.5 ms after the inrush current is 200 mA or less.
- Connect both the AS-i communication cable and the AS-i external power cable to the FM4D1-04TNX slave. There is no need to connect the AS-i external power cable to the FM4D1-40XXN. (As the FM4D1-40XXN's actual slave has no pins to pierce the AS-i external power cable, no problems will result even if you fix the actual slave to the mounting plate while placing the AS-i external power cable on the mounting plate.
- Care should be taken to avoid miswiring like reverse-wiring with regard to connection to external power supply (DC 24V).
  Products might be damaged or burnt out.

Compact terminal-block type slave, FM2D1

KK03-042

FM2D1-04RQX

■ Description

Compact terminal-block type slave with same size of RS4N, 6N relay-and-terminal modules

- Being capable of controlling 100V AC or 200V AC devices that have been in great demand than ever.
- Four relay outputs
- Extreme compact slave as its size is same as RS-4N, 6N relay-and-terminal modules.
- IEC rail/screw dual mounting type
- Four highly-reliable card relays of FUJI's RB104-DE (250V AC, 5A) are built in. Card relays are replaceable.
- Provided with IP20 terminal cover (finger protection) of IEC standards
- The 24V DC power source of the card relays is supplied from AS-i communications cable.
- The LED indicators show the I/O device's operation status.
- The slave's faulty will be indicated by LED indicator.
- AS-i specification: V2.0

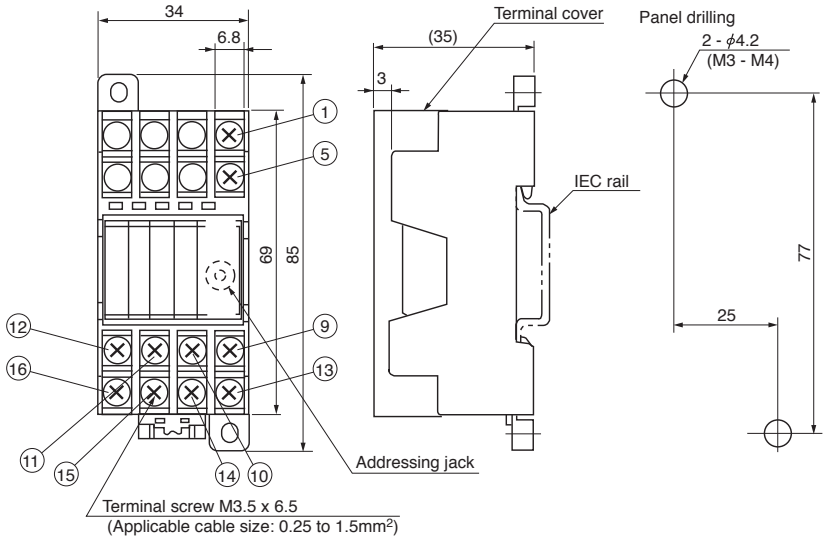
■ Ratings and specifications

Type		**FM2D1-04RQX**
Slave type		Standard slave
Number of inputs/outputs		4 outputs (Relay)
AS-Interface profile (I/O, ID)		8.0
Operating voltage (in accordance with AS-i specification)		26.5 to 31.6V
Current consumption		Max. 60mA
LED indication	AS-i	Green on: Normal operation, Red on: Communication error, Red on and Orange (Green+Red) on alternating: Slave has address=0, Off: Power Off
	OUT1 to OUT4 (Yellow)	On/off: Output on/off
Output (per point)	Type of built-in relay	RB104-DE (NO)
	Contact arrangement	1NO x 4-output
	Contact resistance (before use)	30mΩ or less
	Contact material	Ag alloy (Au-plated)
	Minimum operating voltage and current	0.1V DC, 0.1mA
	Rated continuous current	5A (In the case of side-by-side mounting, derate the current down to 3A or less)
	Max. making and breaking capacities	250V AC 5A, 30V DC 5A
	Operating time (at rated voltage)	10ms or less
	Reset time (at rated voltage)	10ms or less
	Insulation resistance (initial)	100MΩ or more with 500V DC megger
	Dielectric strength	Between same pole contacts: 750V AC, 1min Between different pole contacts: 2000V AC, 1min
	Vibration resistance	10 to 55Hz, duble amplitude 1mm for 2 hours in each direction of X, Y, Z
	Shock resistance	100m/s^2 for 3 times in each direction of X, Y, Z
	Mechanical durability	20 million operations or more
	Electrical durability	100000 operations: 220V AC (ind. load), Making 2A (pf 0.7), Breaking 2A (pf 0.3 to 0.4) 130000 operations: 220V AC (resistive load), Making 3A (pf 1), Breaking 3A (pf 1) 150000 operations: 24V DC (ind. load), Making 1A (L/R 15ms), Breaking 1A (L/R 15ms) 100000 operations: 24V DC (res. load), Making 5A (L/R 1ms or less), Breaking 5A (L/R 1ms or less)
Degree of protection (IEC 60529)		IP20
Operating temperature		–25 to 55˚C (no icing or no condensation)
Relative humidity		85% or less RH (no condensation)

■ Ratings and specifications (continued)

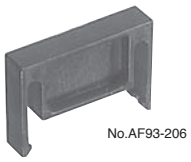
Electrical protection for AS-i connection	Reverse polarity protection	Built-in
	Electrostatic discharge resistance	Contact discharge method: ±4kV Aerial discharge method: ±8kV, IEC 61000-4-2 (Class B)
	Electromagnetic field noise immunity	80 to 1000MHz, Electric field strength: 10V/m, IEC61000-4-3 (Class A)
	Burst noise	2kV (Class B)/1kV (Class A), IEC61000-4-4
Mass		Approx. 70g
Addressing method		Can be done with an addressing unit (FL1HA-E) via an addressing cable (FX9Y002) connected to the addressing jack on the front of the slave. Connecting the addressing cable to a slave will disconnect the slave from the AS-i connection.
Assignment od data bits		
Data bit D0		Output 1
Data bit D1		Output 2
Data bit D2		Output 3
Data bit D3		Output 4

■ Dimensions, mm



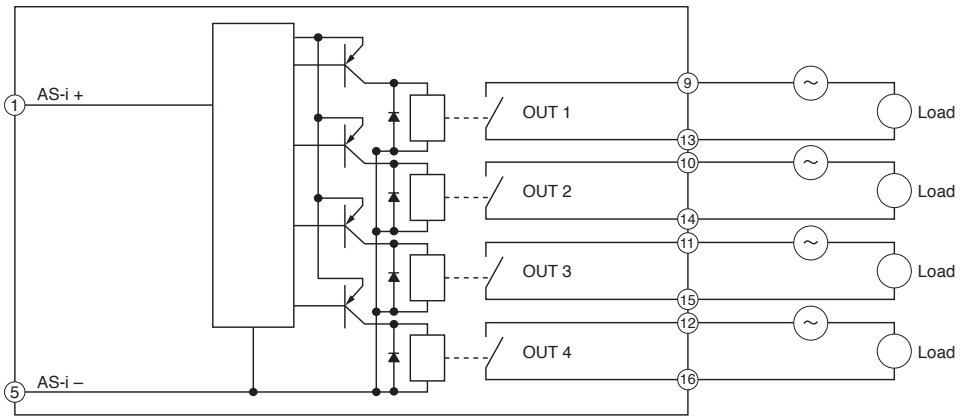
■ Relay remover

Use the relay remover (type TY3) for exchanging relays. Remove and insert relays perpendicularity to the socket surface. Diagonal removing or insertion may bend the relay terminals or damage the sockets.



TY3 (RZ3A)

■ Wiring diagram



Terminal block type slave, FM1D

■ Description

The screw terminal connection of the FM1D slave helps to reduce control panel wiring.

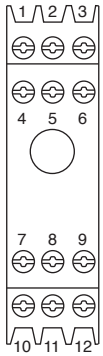
- Short-circuit protection and overload protection are provided for the sensor power supply.
- IEC rail mounting
- The slave is addressed with an addressing jack located on the front of the slave.
- Conforms to EC Directive (No. 89/336/EEC); EN50081-1, EN50082-2.
- AS-i specification: V2.0

FM1D-22TPP

■ Ratings and specifications

Type			**FM1D-22TPP**	**FM1D-22RQP**
Slave			Standard	
Number of inputs/outputs			2 inputs / 2 outputs (PNP)	2 inputs / 2 outputs (Relay)
AS-Interface profile (I/O, ID)			3, 0	3, 0
Operating voltage (in acc. with AS-Interface specification)			26.5 to 31.6V DC	
Current consumption (including sensors)			50mA DC or less	50mA DC or less
LED indication G: Green R: Red Y: Yellow	AS-i (G/R)		G on: Power on, R on and G alternating: slave has address = 0, R on: failure, R flashing: input power overload	
	IN1, IN2 (Y)		On/off: input on/off	On/off: input on/off
	OUT1, OUT2 (Y)		On/off: output on/off	On/off: output on/off
Input	On voltage On current (sink) Off current		10V or more 5mA or less 1.5mA or less	
Sensor power supply via AS-Interface	Short-circuit and overload protection Sensor voltage range Current carrying capacity for all inputs		— 20 to 30V (I ≦ 25mA) 25mA (Ta ≦ 75˚C)	— 20 to 30V (I ≦ 25mA) 25mA (Ta ≦ 60˚C)
Output (per point)	Type of output		Electronics (PNP)	Relay contact
	External power supply (range)		24V DC (20 to 30V)	230V AC
	Current carrying capacity, per point	Average Minimum (DC12/DC13) Minimum (AC15)	2A 1.4A (24V DC) —	6A 1A (24V DC), 0.1A (230V DC) 3A (230V AC)
	Residual voltage		0.8V or less	—
	Response frequency	Res. load Ind. load	200Hz 2Hz	20Hz 1Hz
	Short-circuit and inductive surge protection		Built-in	—
	Inductive surge protection		Built-in	—
	Output status on communication error		Off	Off
Operating temperature			–25 to +70˚C (no icing or no condensation)	–25 to +60˚C (no icing or no condensation)
Storage temperature			–40 to +85˚C (no icing or no condensation)	
Electrical protection for AS-i connection	Reverse polarity protection Electrostatic discharge resistance Electromagnetic field noise immunity Burst noise		Built-in Contact discharge method: ±4kV, Aerial discharge method: ±8kV, IEC61000-4-2 (Class B) 80 to 1000MHz, Electric field strength: 10V/m, IEC61000-4-3 (Class A) 4kV (Class B) /1kV (Class A), IEC61000-4-4	
Shock resistance	IEC rail mounting (IEC68-2-27)		150m/s^2 (11ms)	
Vibration resistance	IEC rail mounting (IEC68-2-6)		10 to 55Hz, 0.5mm one-way amplitude	
Mass			Approx. 150g	
Addressing	Method		Can be done with an addressing unit (FL1HA-E) via addressing cable (FX9Y002) connected to the addressing jack on the slave front. Connecting the addressing cable to a slave will disconnect the slave from the AS-i connection.	
	Number of times (Addresses: between 1 and 31)		15 times. After the 15th address, the slave keeps the last address (in accordance with Slave ASIC (SAP4.0) specifications).	
Approval			CE	

■ Terminal arrangement and logic assignment

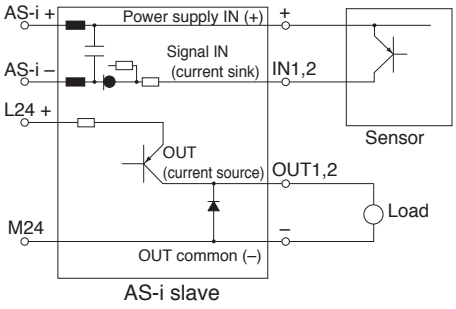


Terminal		FM1D-22TPP	
Symbol	No.	Description	Logic assignment
AS-i–	1	AS-i power supply (–)	
+	2	Power supply IN (+)	
+	3	Power supply IN (+)	
AS-i +	4	AS-i power supply (+)	
IN1	5	Signal IN 1 (current sink)	Data bit D0
IN2	6	Signal IN 2 (current sink)	Data bit D1
L24+	7	External power supply 24V DC (+)	
OUT1	8	OUT 1 (current source)	Data bit D2
OUT2	9	OUT 2 (current source)	Data bit D3
M24	10	External power supply 0V	
–	11	OUT common (–)	
–	12	OUT common (–)	

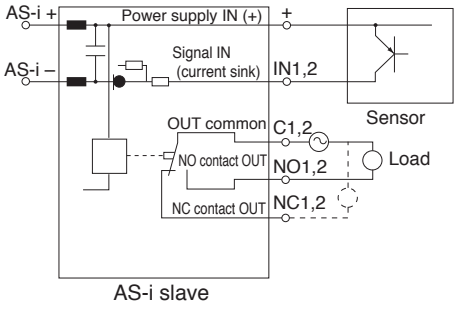
Terminal		FM1D-22RQP	
Symbol	No.	Description	Logic assignment
AS-i–	1	AS-i power supply (–)	
+	2	Power supply IN (+)	
+	3	Power supply IN (+)	
AS-i +	4	AS-i power supply (+)	
IN1	5	Signal IN1 (current sink)	Data bit D0
IN2	6	Signal IN2 (current sink)	Data bit D1
NC1	7	NC contact OUT1	Data bit D2
C1	8	OUT common 1	
NO1	9	NO contact OUT1	Data bit D2
NC2	10	NC contact OUT2	Data bit D3
C2	11	OUT common 2	
NO2	12	NO contact OUT2	Data bit D3

■ Wiring diagrams

FM1D-22TPP

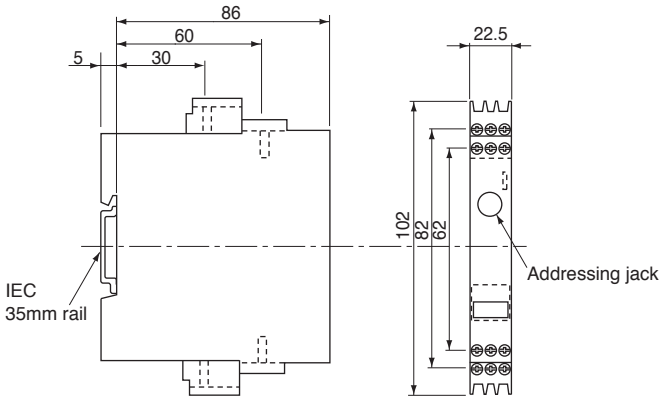


FM1D-22RQP



■ Dimensions, mm

FM1D-22TPP, FM1D-22RQP



Type of cable	Solid wire or stranded wire
Cable size	0.5 to 2.5mm^2
Cable insertion length	7mm
Tightening torque	0.5 to 0.6N•m

■ Precaution on wiring

Core should be taken to avoid miswiring like reverse-wiring with regard to connection to external power supply (24V DC). Products might be damaged or burnt out.

AS-i motor starter slave, FE16D

KK01-136A

FE16D-SJ13RGNE12

■ Description

The FE16D slave incorporates a reversing motor starter for up to 2.2kW, having a sturdy IP65 structure to make it suitable for severe environmental conditions. The FE16D can be used outside the control panel, thus helping to reduce the number of relay boxes and the size of the panel.

- The starter slave can be easily connected to the AS-Interface flat cable by insulation piercing connectors.
- The power cable can be easily connected by a single-action connector.
- A translucent door, which can be padlocked, simplifies addressing and resetting.
- Designed for versatile application, with a motor range of 0.1 to 2.2kW at 200V AC and a thermal overload relay range of 0.1 to 7A.
- AS-i specification: V2.0

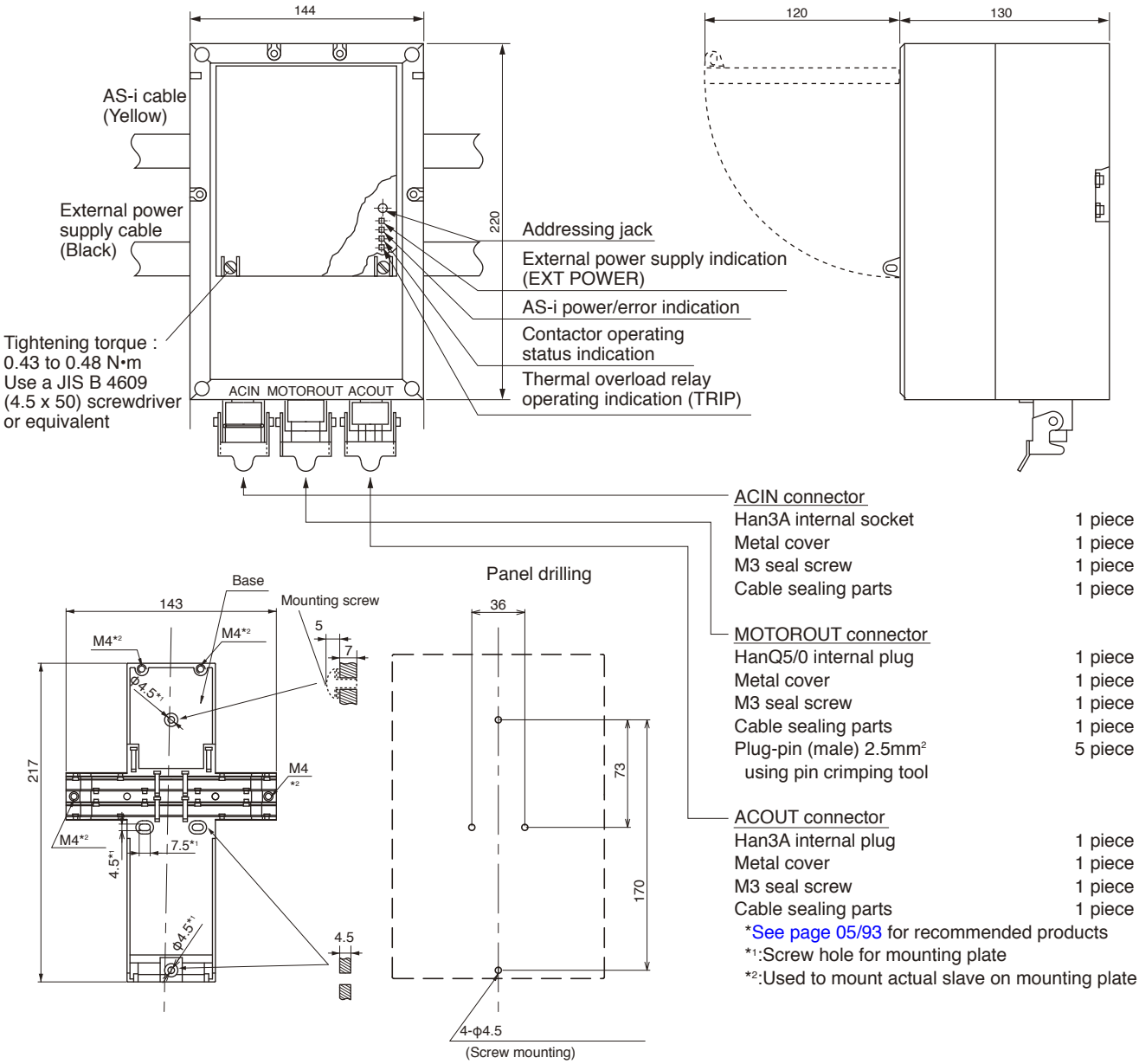
■ Ratings and specifications

Type		**FE16D-SJ13RG∗E12 □□■**			
Built-on thermal overload relay: *		N: TR-0NZ716, E: TK-0NZ716			
Motor capacity: □□ …20 to 25 (0.1 to 2.2kW) Heat element: ■ …A to V (0.1-0.15A to 7.0-11.0A) at 200V AC			□□■		□□■
		0.1kW 0.1-0.15A	20 A	0.4kW 1.4-2.2A	22 M
		0.15-0.24A	20 C	1.7-2.6A	22 N
		0.24-0.36A	20 E	0.75kW 2.2-3.4A	23 P
		0.36-0.54A	20 G	2.8-4.2A	23 R
		0.48-0.72A	20 H	1.5kW 4.0-6.0A	24 S
		0.2kW 0.64-0.96A	21 J	5.0-8.0A	24 T
		0.8-1.2A	21 K	2.2kW 6.0-9.0A	25 U
		0.95-1.45A	21 L	7.0-11.0A	25 V
Slave type		Standard slave			
Number of inputs/outputs		4 inputs /4 outputs (IN3, IN4, OUT3, OUT4: not in use)			
AS-Interface profile (I/O, ID)		7, F			
Operating voltage (in acc. with AS-Interface specification)		26.5 to 31.6V DC			
Current consumption		50mA DC or less			
LED indication G: Green R: Red Y: Yellow	AS-i	G on: normal communication, R on and Orange (G+R) on alternating: slave has address = 0, R on: Communication error, Off: AS-i power off			
	EXT POWER	G on/off: External power on/off			
	MOTOR	Y on/off: Magnetic contactor non-excited/excited			
	TRIP	Y on/off: Thermal overload relay tripped/normal			
Input	On voltage	10V or more			
	Off voltage	6V or less			
	On current	Approx. 5mA			
	Off current	1.5mA or less			
Built-in power supply via AS-Interface	Short-circuit and overload protection	—			
	Voltage range (contact input)	20 to 30V (I ≦ 25mA)			
	Current carrying capacity for allinputs	25mA (Ta ≦ 55˚C)			
Built-in magnet driving output	External power supply	24V DC (20.4 to 28.8V)			
	Type of output	PNP transistor			
	Current carrying capacity	0.2A			
	Voltage drop	1.5V or less			
	Short-circuit protection	—			
	Inductive surge protection	Built-in			
	Output status on communication error	Off			

■ **Ratings and specifications** (Continued)

Magnetic motor starter	Main circuit rating	200V AC, 10A
	Built-in magnetic motor starter *	N: SJ-06WGRM reversing type or E: SJ-06WGRM/2E reversing type
	Auxiliary contact arrangement	2 x (1NO+2NC)
	Coli rated voltage (range)	24V DC (85 to 120% of rated voltage)
	Power consumption	1.4W
	Life expectancy (AC3)	1 million (electrically), 10 million (mechanically)
	TOR heat element	16 types, *see page 84*
Input signal		IN1: MC coil exciting status (data bit: D0) 0: Exciting (FWD/REV), 1: Non exciting IN2: TOR operation (data bit: D1) 0: Normal 1: Trip IN3: Not in use (data bit: D2) IN4: Not in use (data bit: D3)
Output signal		OUT1: Coil drive (FWD) (data bit: D0) 0: Off, 1: On OUT2: Coil drive (REV) (data bit: D1) 0: Off, 1: On OUT3: Not in use (D2) OUT4: Not in use (D3)
Degree of protection (IEC60529)		IP65
Connector for power cable		*See page 05/93* for recommended cables.
Operating temperature		0 to +55˚C (no icing or no condensation)
Storage temperature		–25 to +70˚C (no icing or no condensation)
Connection of communication cable		Via yellow AS-i cable by piercing connector
External power supply method		Via black AS-i cable by piercing connector
Electrical protection for AS-Interface	Reverse polarity protection	Built-in
	Electrostatic discharge resistance	Contact discharge method: ±4kV, Aerial discharge method: ±8kV, IEC61000-4-2 (Class B)
	Electromagnetic field noise immunity	80 to 1000MHz, Electric field strength: 10V/m, IEC61000-4-3 (Class A)
	Burst noise	2kV (Class B)/1kV (Class A), IEC61000-4-4
Shock resistance (IEC68-2-27)		50m/s2 (11ms)
Vibration resistance (IEC68-2-6)		10 to 55Hz, 0.25mm one-way amplitude
Mass		Approx. 2.2kg (including mounting plate)
Addressing method		Can be made with an addressing unit (FL1HA-E) via addressing cable (FX9Y002) connected to the addressing jack on the slave front. Connecting the addressing cable to a slave will disconnect the slave from the AS-Interface.
Approval		CE

■ Dimensions, mm



ACIN connector

Han3A internal socket	1 piece
Metal cover	1 piece
M3 seal screw	1 piece
Cable sealing parts	1 piece

MOTOROUT connector

HanQ5/0 internal plug	1 piece
Metal cover	1 piece
M3 seal screw	1 piece
Cable sealing parts	1 piece
Plug-pin (male) 2.5mm²	5 piece
using pin crimping tool	

ACOUT connector

Han3A internal plug	1 piece
Metal cover	1 piece
M3 seal screw	1 piece
Cable sealing parts	1 piece

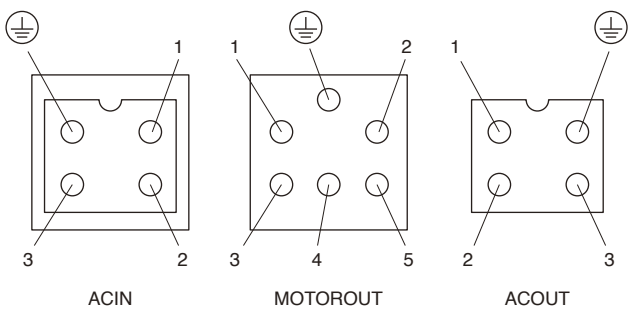
*See page 05/93 for recommended products

*1:Screw hole for mounting plate

*2:Used to mount actual slave on mounting plate

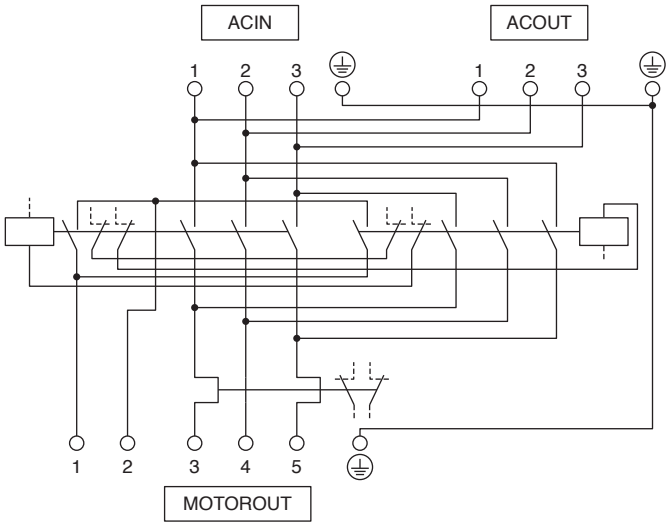
■ Pin arrangement

	Pin No.	Name
ACIN	1	L1
	2	L2
	3	L3
	GND	GND
MOTOROUT	1	Aux. contact NO output
	2	Aux. contact NO output
	3	T1
	4	T2
	5	T3
	GND	GND
ACOUT	1	L1
	2	L2
	3	L3
	GND	GND

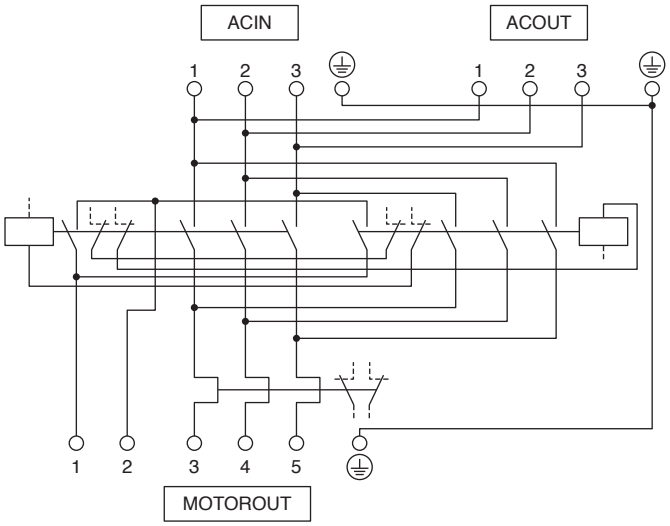


■ Internal circuit

• Type FE16D-SJ13RGNE12 □□■

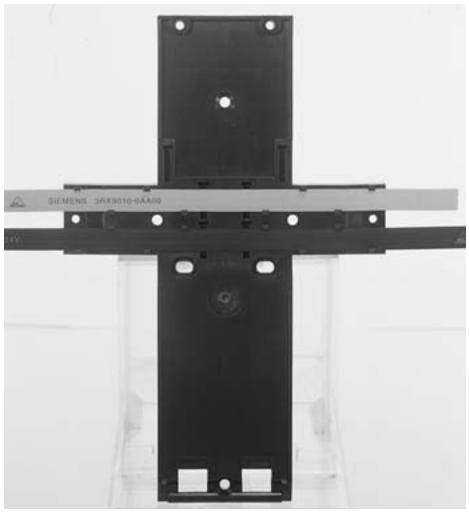


• Type FE16D-SJ13RGEE12 □□■



■ How to fit AS-i cable on mounting plate

- Place a yellow AS-i communication cable on the upper (AS-i) side of the mounting plate.
- Place a black AS-i external power cable on the lower (EXT POWER) side.



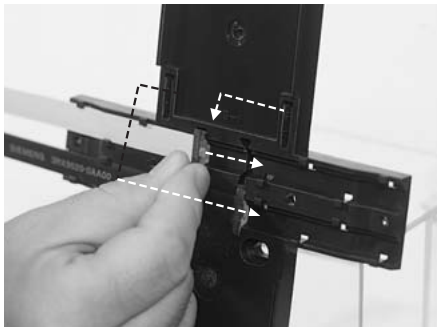
The cables have polarity. Place correctly the cables to match the cable's cross section and the groove of the mounting plate.

■ Precautions on wiring

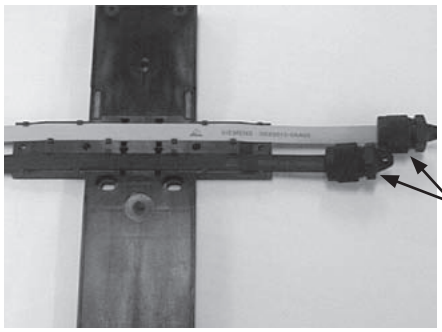
- Care should be taken to avoid mis-wiring like reverse-wiring with regard to connection to external power supply (24V DC).
  Products might be damaged or burnt out.

■ Cable termination

- When the starter slave has to be connected at the AS-i cable end, remove the spacer from the mounting plate to attach it to the cable end.



Never fail to attach the spacer to prevent foreign objects coming in.



Attach a cable-end piece (3RK1901-1MN00)

Where waterproof is required (IP65, IP67, etc.)

05

Digital picking slave, FM4DP

FM4DP2 KK04-009

■ Description

A multi-purpose slave with a 2-digit, 7-segment display and illuminated pushbutton switch.

- An excellent user interface achieved with a dedicated FB (function block) combining FUJI's PLC and MICREX-SX.
- Ideal for small- and medium-scale digital picking systems.
- A 2-core type made possible with AS-interface communications, featuring two 7-segment displays and a brightly illuminated pushbutton switch.
- Layout changes can be made using the AS-i's flexible wiring method without requiring manufacturer-authorized engineers, thus contributing to a considerable reduction in total costs during the customer's product life cycle.
- Like other slaves, advanced piercing technology is used for AS-i cable connection, allowing the cable to be crimped and connected with ease.
- The pushbutton switch has a positive clicking feel and distinctive coloring.
- Features a connector port for adding limit switches.
- Conforms to AS-i specifications V2.0, V2.1.

■ Ratings and specifications, with 7-segment display

Type	7-segment display 7-segment display with spotlight		**FM4DP2-GR1G** **FM4DP2-GR1GS**	**FM4DP2-GR1R** **FM4DP2-GR1RS**	**FM4DP2-RR1R** **FM4DP2-RR1RS**	**FM4DP2-RR1G** **FM4DP2-RR1GS**
Slave type			Standard			
Display color	10's digit		Green	Green	Red	Red
	1's digit		Red	Red	Red	Red
Pushbutton illuminated color			Green	Red	Red	Green
AS-i profile (I/O, ID)			7, F			
Control voltage (depending on AS-i specifications)			26.5 to 31.6V Supplied from AS-i line (with no external power supply required)			
Current consumption			75mA max. (with "88" displayed on 7-segment indicator and illuminated pushbutton switch ON) 45mA max. (with 7-segment indicator and illuminated pushbutton switch turned OFF)			
Display	AS-i		Green LED ON: AS-i power supply turned ON (Normal operation) Red LED and orange (red mixed with green) LED lit alternately: address 0 Red LED ON: Communications error			
	Illuminated pushbutton switch		Illuminated color: Green (24mm dia.)	Illuminated color: Red (24mm dia.)		Illuminated color: Green (24mm dia.)
	7-segment	1's digit character height	13 to 14mm (red)	13 to 14mm (red)	13 to 14mm (red)	
		10's digit character height	13 to 14mm (green)	13 to 14mm (green)	13 to 14mm (red)	
Input signal			NO contact (illuminated pushbutton switch)			
Output signal			• Illuminated pushbutton switch ON • 7-segment-indicator (4-bit output from AS-i slave IC is processed in microcomputer and displayed)			
Logic allocations			Input *1		Output	
			Type	Data bit	Type	Data bit
			Pushbutton switch and side connector *2	D0	Illumination and spotlight *3	D0 to D3
					7-segment	D0 to D3
Degree of protection			IP40			
Pushubutton switch		Operation force	1.1 to 1.7N			
		Durability	3,000,000 (at a switching speed of 3,600 times/h with a maximum operation force of 2N)			
		Control structure strength	Operating direction 30N (with no deformation of the control structure or operation errors)			
Temperature		Operating temperature range	–10°C to +40°C			
		Storage temperature range	–25°C to +70°C			
Operating ambient humidity			35 to 85% (with no condensation)			
Electrical protection for AS-i connection		Reverse polarity protection	Built in			
		Electrostatic discharge resistance	Contact discharge method: ±4kV; Aerial discharge method: ±8kV; IEC61000-4-2 (Class A)			
		Electromagnetic field noise	80 to 1000MHz, electric field strength: 10 V/m, IEC61000-4-3 (Class A)			
		Burst noise	2kV (Class B)/1kV (class A), IEC61000-4-4			
Shock resistance			Screw mounting: 300 m/s^2 (18 ms), IEC68-2-27			
Vibration resistance			Screw mounting: 10 to 55 Hz, 1.0mm one-way amplitude, IEC68-2-6			
Mounting pipe diameter			27 to 30mm dia.			

Notes: *1 An input signal with a minimum duration of 150 ms is accepted normally. If the duration is less than 150 ms, the input will not always be accepted.
*2 The pushbutton switch and the two-pin connector on the side of the unit are connected in parallel. Two-pin connector is not provided with spotlight-integrated picking slaves.
*3 A illuminated pushbutton and spotlight are connected in series.

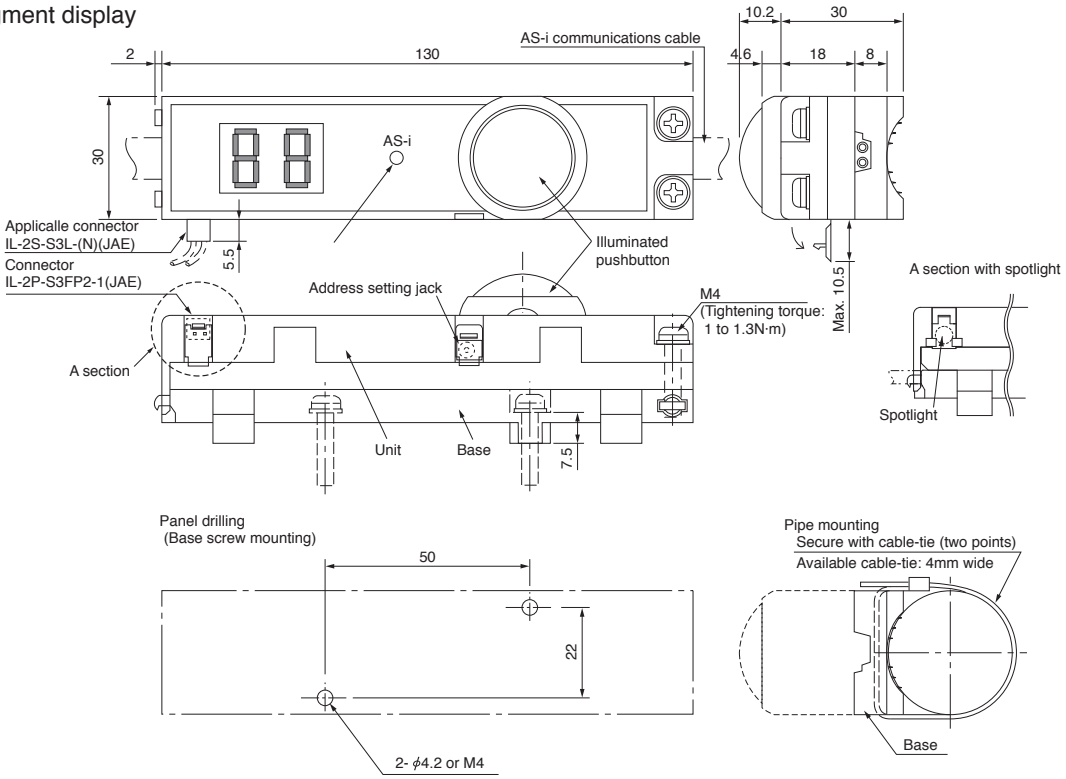
■ Ratings and specifications, with illuminated pushbutton

Type	Illuminated pushbutton Illuminated pushbutton with spotlight	**FM4DP0-001G** **FM4DP0-001GS**		**FM4DP0-001R** **FM4DP0-001RS**	
Slave type		A/B slave			
AS-i profile (I/O, ID, ID2)		7, A, F (The initial value of ID1 is 7, Variable from 0 to 7)			
Control voltage (depending on AS-i specifications)		26.5 to 31.6V Supplied from AS-i line (with no external power supply required)			
Current consumption		65mA max. (with illuminated pushbutton switch ON) 45mA max. (with illuminated pushbutton switch turned OFF)			
Display	AS-i	Green LED ON: AS-i power supply turned ON (Normal operation) Red LED and orange (red mixed with green) LED lit alternately: address 0 Red LED ON: Communications error			
	Illuminated pushbutton switch	Illuminated color: Green (24mm dia.)		Illuminated color: Red (24mm dia.)	
Input signal		NO contact (illuminated pushbutton switch)			
Output signal		• Illuminated pushbutton switch ON			
Logic allocations		Input		Output	
		Type	Data bit	Type	Data bit
		Pushbutton switch and side connector *1	D0	Illumination and spotlight *2	D1
Degree of protection		IP40			
Pushubutton switch	Operation force	1.1 to 1.7N			
	Durability	3,000,000 (at a switching speed of 3,600 times/h with a maximum operation force of 2N)			
	Control structure strength	Operating direction 30N (with no deformation of the control structure or operation errors)			
Temperature	Operating temperature range	–10°C to +40°C			
	Storage temperature range	–25°C to +70°C			
Operating ambient humidity		35 to 85% (with no condensation)			
Electrical protection for AS-i connection	Reverse polarity protection	Built in			
	Electrostatic discharge resistance	Contact discharge method: ±4kV; Aerial discharge method: ±8kV; IEC61000-4-2 (Class A)			
	Electromagnetic field noise	80 to 1000MHz, electric field strength: 10 V/m, IEC61000-4-3 (Class A)			
	Burst noise	2kV (Class B)/1kV (class A), IEC61000-4-4			
Shock resistance		Screw mounting: 300 m/s^2 (18 ms), IEC68-2-27			
Vibration resistance		Screw mounting: 10 to 55 Hz, 1.0mm one-way amplitude, IEC68-2-6			
Mounting pipe diameter		27 to 30mm dia.			

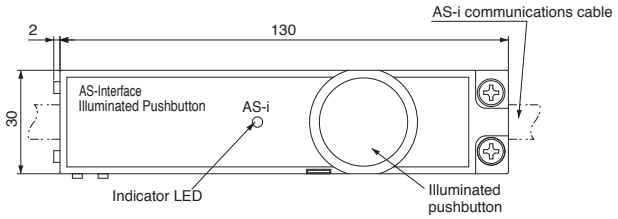
Notes: *1 The pushbutton switch and the two-pin connector on the side of the unit are connected in parallel. Two-pin connector is not provided with spotlight-integrated picking slaves.
*2 A illuminated pushbutton and spotlight are connected in series.

■ Dimensions, mm

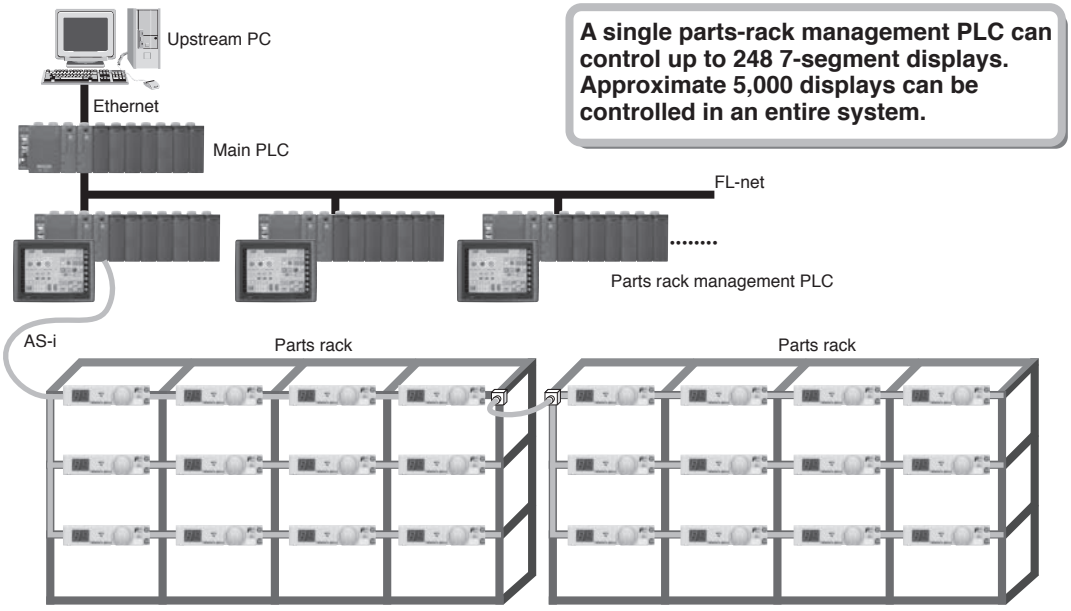
• 7-segment display



• Illuminated pushbutton



■ System configuration example



A single parts-rack management PLC can control up to 248 7-segment displays. Approximate 5,000 displays can be controlled in an entire system.

FRN□□□C1S-■AJ
Inverters connectable to AS-Interface Network

■ Overview
- Conformity with various power voltages worldwide
  (1-phase 100V, 1-phase 200V, 3-phase 200V, 3-phase 400V)
- Applicable motor capacity
  0.1kW to 3.7kW
- Easy setting, simple wiring
- Conformity with IP20

■ Functions
Input signal

4-bit input acceptable
Bitwise function allocation can be made by function code data setting.
- Forward rotation, stop command
- Reverse rotation, stop command
- Alarm reset signal
- Multi-frequency selection
- Acceleration/deceleration time selection
- Coast-to-stop command
- Jogging operation
  Any of the above functions is selectable.

Optimized functions best suited for traversing conveyance

High starting torque (150% or more)
Braking unit built-in (0.4kW or more)
Braking resistor built-in model (Semi-standard)
Trip-free operation (Current limiting function)

Output signal

2-bit outputs can be issued.
Bitwise function allocation can be made by function code data setting.
- Alarm output (for any fault)
- Running signal
- Frequency arrival signal
- Current limiting signal
- Motor overload early warning signal
- Low level current detection signal
  Selective allocation from the functions above

Three types of function code data settings

Keypad
Remote keypad with data copy function (Option)
Inverter loader software

05

■ Model variation

Nominal applied motor (kW)	Input power			
	3-phase 200V	3-phase 400V	1-phase 200V	1-phase 100V
0.1	○	—	○	○
0.2	○	—	○	○
0.4	○	○	○	○
0.75	○	○	○	○
1.5	○	○	○	—
2.2	○	○	○	—
3.7	○	○	—	—

AS-i power supply, FP1

FP1AA-JNW072

■ Description

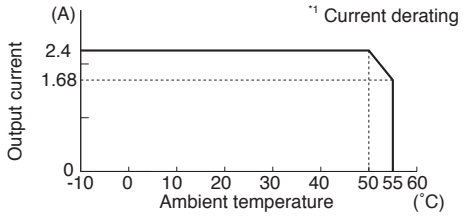
The AS-i power supply provides electric power for slaves and sensors through the AS-i communication line. This power supply allows data and power transmission on one line. This unit is also used to extend the transmission distance using the repeaters.

- FP1AA has a wide range of rated input voltage 100 to 230V AC.
- Overcurrent protective function is built-in.
- Conforms to the following EC Directives:
  Low Voltage Directive (No.73/23/EEC): EN60950
  EMC Directive (No. 89/336/EEC): EN50081-1, EN50082-2
- IEC rail mounting

■ Ratings and specifications

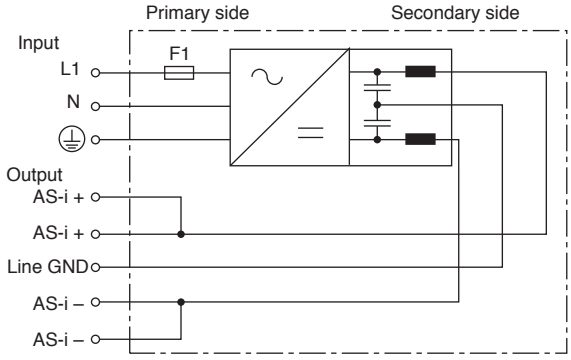
Type		**FP1AA-JNW072**
Application		AS-i communication
Rated input voltage		100 to 230V AC (continuous)
Operating voltage range		85 to 235V AC
Rated frequency		50/60Hz (47 to 63Hz)
Power dropout tolerance (at 100V AC)		20ms or more
Rated input current (100/200V AC)		Approx. 1.9/1.0A
Inrush current (230V AC)		40A or less
Output voltage	Rated voltage	30V DC for communication
	Voltage stabilization	±2%
	Ripple noise	150mV$_{P-P}$ or less
Efficiency		80% or more
Output power		72W
Rated output current (current range)		2.4A (0 to 2.4A) Current derating at 50˚C or more *1
Output short-circuit protection		Auto-reset
Protection class (IEC536)		Class I
Secondary side insulation (EN60950)		Yes (SELV: Safety-Extra Low Voltage)
Radio interference suppression (EN55011)		Class B
Degree of protection (IEC60529)		IP20
Operating temperature		–10 to +55˚C (no icing or no condensation)
Storage temperature		–25 to +85˚C (no icing or no condensation)
Relative humidity		Less than 90%RH (no condensation)
AS-i cable connecting method		Spring-clamp terminal
Shock resistance (IEC68-2-27)		150m/s^2 (11ms)
Vibration resistance (IEC68-2-6)		10 to 55Hz, 0.5mm one-way amplitude
Mass		Approx. 700g
Approvals		cUL (UL1950, CSA950), CE, TÜV

Note : Fuse not replaceable



■ Wiring diagrams

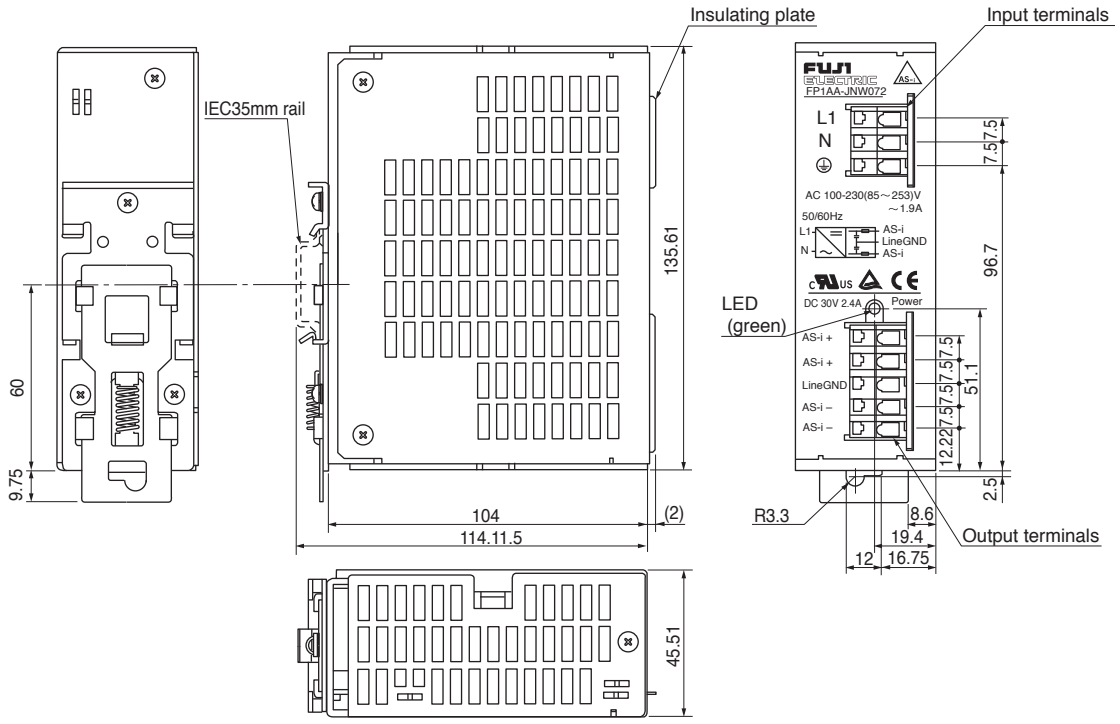
FP1AA-JNW072



* Fuse F1 not replaceable

■ Dimensions, mm

FP1AA-JNW072



Terminal *1	Wire size *2	Wire insertion length	Tightening torque
Input	0.08 to 2.5mm^2	5 to 6mm	— (Screwless terminal)
Output	0.08 to 2.5mm^2	5 to 6mm	— (Screwless terminal)

*1 WAGO-made terminal 741-30□ series or equivalent
*2 When a stick terminal is connected with the cramped electric wire, the maximum wire size becomes one size smaller than the rated value.

Recommended stick terminal crimping tool: 206-204 (WAGO)

Wire size (mm^2)	Type of stick terminal	Manufacturer
0.25	216-321	WAGO Corporation
0.5	216-221	
0.75	216-222	
1.0	216-223	
1.5	216-224	
2.08	216-205	

Repeater and extender

■ Description

An FX9R031 repeater and FX9R032 extender can extend the AS-i transmission distance by up to 100m respectively.
Up to 2 repeaters can be connected in series. The 2 lines (segments) connected to a repeater are insulated and those connected to an extender are not.

- The power supply status of the 2 lines connected to a repeater is indicated on the repeater.

FX9R031

■ Ratings and specifications

Type		Repeater **FX9R031**	Extender **FX9R032**
Power supply		Supplied from AS-i line	
Power consumption from the AS-i cable		Up to 100mA per AS-i line	
Insulation between AS-i LINE1 and LINE2		Insulated	Not insulated
Indication		AS-i power supply LINE1 and LINE2: Green LED	
Cable extension length		100m (Total distance: up to 300m, using 2 repeaters in series)	Up to 100m, 1 extender only
Degree of protection (IEC60529)		IP67 (with mounting plate and cables)	
Operating temperature		0 to +60˚C (no icing or no condensation)	
Storage temperature		–40 to +70˚C (no icing or no condensation)	
Electrical protection for AS-Interface	Reverse polarity protection	—	
	Electrostatic discharge resistance	Contact discharge method: ±4kV, Aerial discharge method: ±8kV, IEC61000-4-2 (Class B)	
	Electromagnetic field noise immunity	80 to 1000MHz, Electric field strength: 10V/m, IEC61000-4-3 (Class A)	
	Burst noise	2kV (Class B)/1kV (Class A), IEC61000-4-4	
Shock resistance (IEC68-2-27)		300m/s^2 (18ms) (screw mounting) / 150m/s^2 (11ms) (rail mounting)	
Vibration resistance (IEC68-2-6)		10 to 55Hz, 1mm (screw mounting) / 0.5mm one-way amplitude (rail mounting)	
Mounting method		Rail/screw dual mounting	
Accessory		Mounting plate	
Mass		Approx. 200g (including mounting plate)	

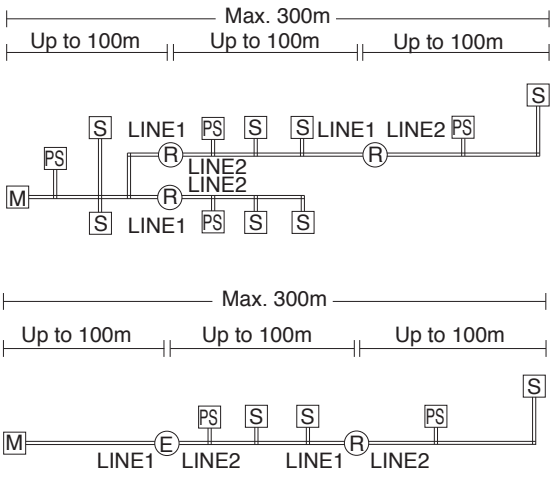
■ Connection example

Repeater

Since the two cables connected to a repeater R are isolated each other, an AS-i power supply must be installed between repeaters.
In one AS-i system, up to 2 repeaters can be connected in series, and multiple repeaters in parallel.
The total maximum AS-i cable length is 100m that can be connected to an AS-i power supply.
The AS-i transmission distance can be extended up to 300m if up to 100m AS-i cable per segment is connected in series.
(Please consult with Fuji Electric FA when you intend to use 2 repeaters in series.)

Extender

No AS-i slaves and AS-i power supplies cannot be installed between the AS-i master and extender E.
The cable length is max. 100m.
Extenders cannot be connected in parallel.
The total maximum AS-i cable length is 100m that can be connected to an AS-i power supply.
The AS-i transmission distance can be extended up to 300m if up to 100m AS-i cable per segment is connected in series.
(Please consult with Fuji Electric FA when you intend to use an extender and repeater in series.)

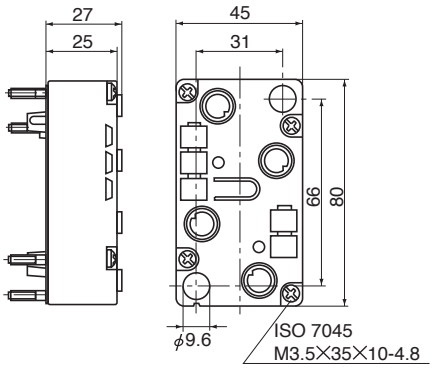


R: AS-i repeater
E: AS-i extender
M: AS-i master
S: AS-i slave
(Total No. of slaves = Max. 62)
PS: AS-i power supply

■ **Dimensions, mm**

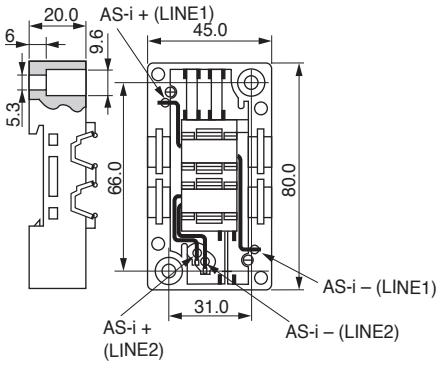
Repeater FX9R031
Extender FX9R032

AF99-107



Dedicated mounting plate (supplied)

AF99-98



05

Addressing unit, FL1HA-E

■ Description

Incorporates versatile new functions compatible with version 2.1.

- In addition to conventional address setting functions, this unit makes it possible to read the addresses of slaves on the AS-i line and the I/O data of the slaves.
- Address settings can be made for standard slaves and A/B slaves.
- Address settings can be made for slaves provided with an addressing jack (e.g., FM6D□1, FM4D, FM2D1, and FM1D slaves) over an address setting conversion cable (FX9Y002).

FL1HA-E
KK04-008

FX9Y002
AF99-103

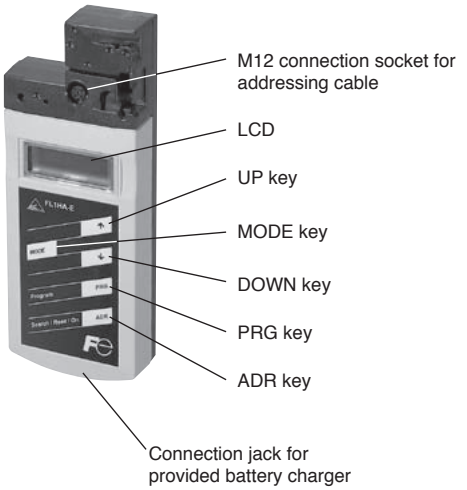
■ Ratings and specifications

Type	**FL1HA-E**
Operating temperature range	0 to 40˚C
Storage temperature range	–20 to 40˚C
Display	LCD
Control key	Flat key (Numeric 5-key pad)
Degree of protection	IP20
Power supply	Built-in secondary battery Charging time: Approx. 14h (with provided battery charger)
Secondary battery life	Addresses can be read or written approximately 250 times with a full charge. If the battery is charged and discharged for a maximum of 500 cycles, the number of possible address reading and writing times will be gradually reduced by the battery memory effect.
Battery charger	Provided
Adressing cable	FX9Y002 (sold separately)
AS-i specifications	Version 2.1 compatible

■ Control key functions

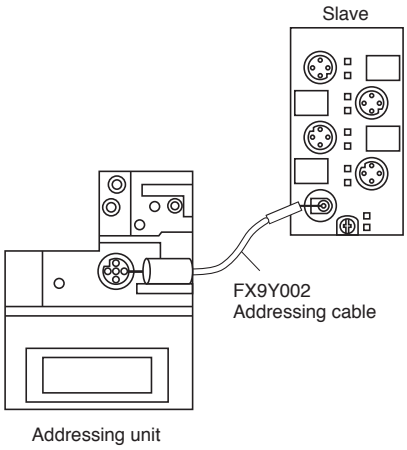
Key display	Function
ADR	Reads the addresses of connected slaves. The power will be automatically turned off if no operation is made for approximately one minute or more.
PRG	Writes addresses to connected slaves.
MODE	Selects operating modes.
↓	Selects and subtracts addresses or data.
↑	Selects and adds address or data.

■ Name of each part



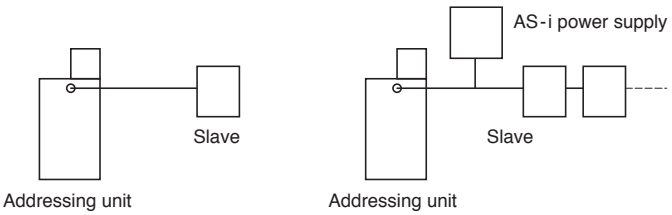
■ Address Setting Procedure (Address Setting Function)

(1) Connect a slave to the addressing unit.
(2) Press the ADR key to read the presently set address. The value on the right-hand side is decimal. A standard slave does not have any prefix, but A or B slaves have the prefix A or B. When a slave is communicating with the addressing unit, the small number on the lower part will blink at approximately 0.5-second intervals.
(3) Press the UP or DOWN key to display the new address.
(4) Press the PRG key to register the new address.



■ Error display

Code	Description	Configuration 1	Configuration 2
F1	Overloading or short-circuiting of the communications power supply provided from the unit.	○	—
F2	The slave is disconnected, the slave is not connected properly, or a failure occurred in reading the slave.	○	—
F3	An error occurred in writing the address or ID code 1.	○	—
F4	An error occurred in an address setting. (An attempt was made to write a duplicated address.)	○	—
	An error occurred in an address setting. (The same address is already in use.)	—	○
F5	An error occurred in a settings change. (A slave with address 0 is connected.)	—	○
F6	An error occurred in a standard slave setting. (An attempt was made to write an A/B slave address, e.g., 01A or 01B, to a standard slave.)	○	○
F7	An error occurred in an A/B slave setting. (An attempt was made to write a standard slave address, e.g., 01 or 02, to an A/B slave.)	○	○
F8	The response signal from the slave was not received correctly.	○	○
▭	The secondary battery needs charging.	○	○



Configulation 1 Configulation 2

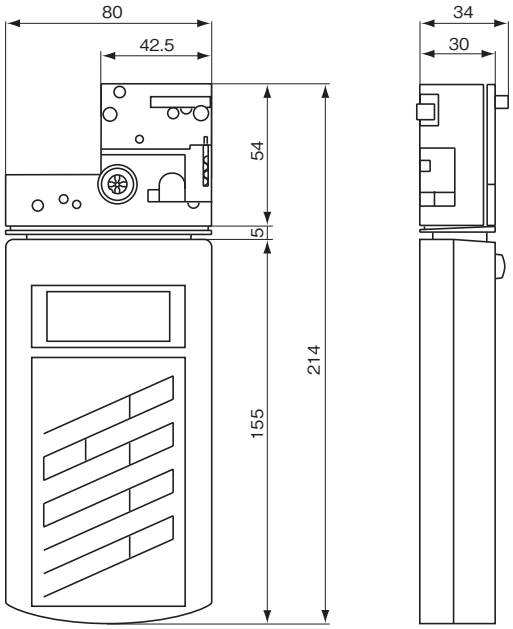
Addressing unit

■ Other functions

Press the ADR key to turn on the power first. Then press the MODE key to select the following functions. Use the PARA and DATA functions only in functional tests for slaves.

Name	Function
ID	Reads the ID code.
ID1	Reads and writes ID code 1 (for version 2.1 compatible models only).
	Set the value with the UP or DOWN keys and press the PRG key to overwrite the ID code.
ID2	Reads ID code 2 (for version 2.1 compatible models only).
IO	Reads the IO code.
PERI	Peripheral fault flag indication (for version 2.1 compatible models only).
	If a slave is using this option flag, there will be no error while 0 is displayed. The display will change to 1 if an error occurs.
PARA	Displays and writes parameters. Check that the address of the slave is other than 0 before selecting this function.
	When this function is selected, the default value (F) will be displayed. Set the value (hexadecimal) with the UP or DOWN keys and press the PRG key. The parameter will then be sent to the slave once. By pressing the ADR key at this time, the last parameter written can be checked. After the slave is connected, the slave will operate according to the parameter as long as this function is operating. Once the slave is disconnected or another function is selected, the currently set parameter will be lost.
DATA	Reads input data and writes output data. Check that the address of the slave is other than 0 before selecting this function.
	The function transfers data while the ADR or PRG key is pressed. With this function selected, input data will be read once and displayed in hexadecimal. While the ADR key is pressed, the data of the slave will be read continuously. When the ADR key is released, communication with the slave will stop. Set the value (hexadecimal) with the UP or DOWN keys and PRG key when writing output data. The data will then be transferred once. The data will be output to the slave continuously while the PRG key is pressed. When the ADR key is released, communication with the slave will stop.

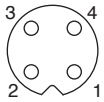
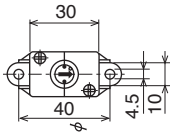
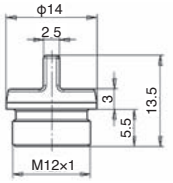
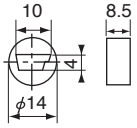
■ Dimensions, mm



■ Precautions

- A system error may occur when overwriting an address, parameter, data, or ID code 1, which could result in equipment damage or physical harm. Confirm the safety of any change before making it.
- Use the provided battery charger to charge the secondary battery. Approximately 14 hours is required to fully charge the battery.
- If the automatic address setting function is used, make sure that the previous ID code 1 value remains after the slave is changed. Automatic address settings will not be made if the ID code 1 value is different.
- Operation using the PARA and DATA functions imposes a heavy load on the secondary battery. The continuous use of these functions will quickly deplete the voltage of the secondary battery.

■ AS-i accessories

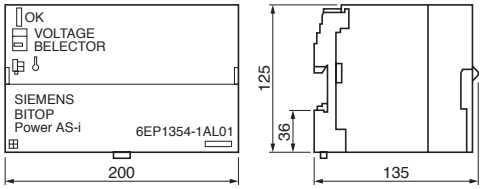
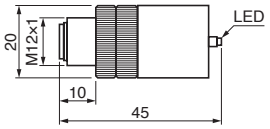
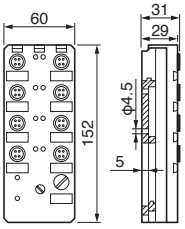
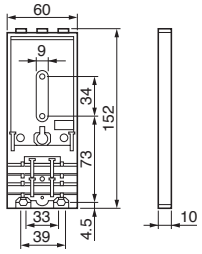
Description		Type
M12 branch connector AF97-580	• Adapts flat AS-i cable to round cable. • Connection of AS-i cable by piercing  Pin No. / Communications cable / External power cable 1 / AS-i + / + 24V 2 / NC / NC 3 / AS-i - / 0V 4 / NC / NC  	**3RX9801-0AA00**
Waterproof cap KK05-001	• Used to cover unused sockets of the waterproof slaves to satisfy IP67. • Minimum order quantity: 10 pieces  	**3RK1901-1KA00**
Gasket Pg11 for AS-i cable AF97-580	• For insertion in Pg11 screwed glands • Minimum order quantity: 10 pieces  	**3RX9805-0AA00**
Cable-end piece KK04-096	• Used when degree of protection IP67 is required. • Minimum order quantity: 10 pieces	**3RK1901-1MN00**

■ Output type of Fuji's FA sensor

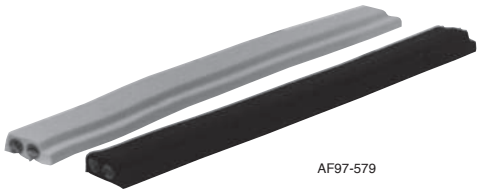
Output	Description	Type
DC supply 3-wire NPN output	Inductive type proximity switch	Cylindrical type: PE1-C □ D, PE2-C □ D Square type: PE-B □ D Flat type: PE-T □ D Slot type: PE-U12D, PE-U25NT Compact square type: PE1B2P-D
	Photoelectric proximity switch	Optical fiber, amplifier built-in type: PH21A -P □ N Amplifier built-in type: PH1C □ - □, PH8AU- □
DC supply 3-wire PNP output	Inductive type proximity switch	Cylindrical type: PE1-C □ Q, PE2-C □ Q Square type: PE-B □ Q Flat type: PE-T □ Q
DC supply 2-wire	Inductive type proximity switch	Cylindrical type: PE1-C □ S, PE2-C □ , PE2C-C □ S Square type: PE-B □ S Flat type: PE-T □ S
Contact output	Magnetically operated type	All types
	Photoelectric proximity switch	AC/DC input type: PH4C □ - □
	Limit switch	All types

Note: FA sensors with pre-wired connector are also available for connecting with waterproof slaves.

■ AS-i accessories (Manufacturer: Siemens)

Description		Type
AS-i power supply KK04-094	Input voltage: 120/230V AC Output voltage: 30V DC Output current: 4A 	**6EP1354-1AL01**
AS-i analyzer 	Monitors and traces the AS-i network communications to reduce maintenance and analyzing cost greatly.	**3RK1904-3AB00**
Extension plug 	Doubling of the cable length per AS-i segment from 100 to 200 meters Note:The AS-Interface Standard stipulates that the cable length per segment be max. 100m. It is recommended that you analyze your system with an AS-i analyzer after you made system configuration. 	**3RK1901-MX00**
K60 compact module 	4-Input / 3-output PNP, A/B slave, Y-II assignment 4-Input / 4-output PNP, Standard slave, Standard assignment 	**3RK2400-1FQ03-0AA3** **3RK1400-1CQ00-0AA3**
K60 mounting plate 	For wall mounting For rail mounting 	**3RK1901-0CA00** **3RK1901-0CB00**

AS-Interface cables Siemens bland, 3RX90



3RX9010-0AA00 (Yellow) **3RX9020-0AA00 (Black)**

■ Description

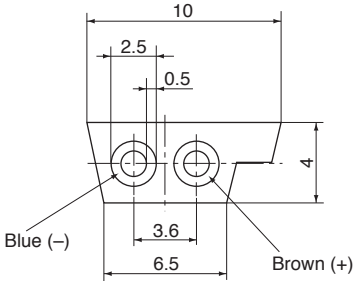
The AS-i cable is a two-core cable specially designed to connect AS-i devices. The yellow AS-i cable supplies 30V DC power to sensors and transfers data. The black AS-i cable can be used for 24V DC actuators (e.g., solenoid valves).

- A trapezoidal cross section is adopted to prevent polarity reversal.
- Three kinds of cable are available to suit environmental conditions: general-purpose (EPDM) and oil-tight (TPE, PUR) use.
- The connection uses the insulation piercing technology. insulation piercing connection.
- The cable's insulation recovers after the connected slaves are detached.

■ Ratings and specifications

Type	3RX9010-0AA00	3RX9013-0AA00	3RX9015-0AA00	3RX9020-0AA00	3RX9023-0AA00	3RX9025-0AA00
Application	AS-i communications, 30V DC			24V DC external power supply		
Environmental condition	General-purpose use	Oil-tight use		General-purpose use	Oil-tight use	
Cable color	Yellow			Black		
Cable sheath material (DIN VDE 0207)	Ethylene Propylene Diene Monomer (EPDM)	Thermoplastic Elastomers (TPE)	Polyurethane (PUR)	Ethylene Propylene Diene Monomer (EPDM)	Thermoplastic Elastomers (TPE)	Polyurethane (PUR)
Sheath color of core	Brown (AS-i (+)), Blue (AS-i (–))			Brown (24V DC (+)), Blue (0V)		
Core cross-section (DIN VDE 0295)	2 x 1.5mm^2			2 x 1.5mm^2		
Cable length per packing	100m roll			100m roll		
Operating temperature	–25 to +85˚C	–30 to +105˚C	–20 to +90˚C	–25 to +85˚C	–30 to +105˚C	–20 to +90˚C
Storage temperature	–40 to +85˚C	–40 to +105˚C	–40 to +90˚C	–40 to +85˚C	–40 to +105˚C	–40 to +90˚C
Smallest permissible bending radius (DIN VDE 0298 Part 300)	Fixed installed: 12mm Freely movable: 24mm			Fixed installed: 12mm Freely movable: 24mm		
Bending performance (DIN VDE 0472 Part 603)	No break after 30,000 back and forward movements			No break after 30,000 back and forward movements		
Behavior in fire (DIN VDE 0472 Part 804 test B)	Flammable	Flame-resistant		Flammable	Flame-resistant	
Halogen free	Yes	Halogen material contained		Yes	Halogen material contained	
Ozone and weather resistance	Non-resisting	Resisting		Non-resisting	Resisting	
Oil resistance	Non-resisting	Resisting		Non-resisting	Resisting	
Water soluble cutting fluid resistance	Resisting	Non-resisting	Resisting	Resisting	Non-resisting	Resisting
Approval	—	UL1581, UL758 CSA22.2 cUL No.210.2	—	—	UL1581, UL758 CSA22.2 cUL No.210.2	—

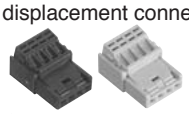
■ Dimensions, mm



■ Connectors for waterproof slaves

Description		Type	Applicable cable Diameter Condactor cross-section	Manufacturer
M12 connector (straight)	Screw connector KK02-196A	**SACC-M12MS-4CON-PG7-M**	4 to 6mm 0.25 to 0.75mm^2	Phoenix Contact
	Insulation displacement connector KK02-174	**SACC-M12MS-4QO-0.75-M**	4 to 7.5mm 0.34 to 0.75mm^2	Phoenix Contact
		SACC-M12MS-4QO-0.34-M	3.5 to 6 0.14 to 0.34mm^2	
	Screw connector KK02-173	**RSC4/7**	3 to 6.5mm 0.75mm^2	Lumberg
M12 connector (L-shaped)	Screw connector KK02-194A	**SACC-M12MR-4CON-PG7-M**	4 to 6mm 0.25 to 0.75mm^2	Phoenix Contact
	Screw connector KK02-172	**RSCW4/7**	3 to 6.5mm 0.75mm^2	Lumberg
M8 connector (straight)	Soldering KK02-197A	**SACC-M8MS-3CON-M**	3.5 to 5mm 0.25mm^2	Phoenix Contact
M8 waterproof cap	—	**PROT M8**	—	Phoenix Contact

■ Connectors for dustproof slaves

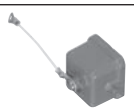
Description		Type	Applicable cable cross-section	Connector color	Manufacturer
Connectors for dustproof slaves	Insulation displacement connector  KK02-176	**QZ-61-H4SFUT1#10**	0.08 to 0.2mm^2	Light blue	Honda Tsushin Kogyo
		QZ-61-H4SFUT3#10		Light green	
		QZ-61-H4SFUT2#10	0.3mm^2	Blue	
		QZ-61-H4SFUT4#10		Green	

■ Others

Description		Type	Manufacturer
Relaying cable	Straight (female) + straight (male) Cable length: 1.5m	**SAC-4P-M12MS/1.5-PUR/M12FS**	Phoenix Contact
	Straight (male) + straight (male) Cable length: 1m	**SAC-4P-M12MS/1.0-PUR/M12MS**	
Branch connector	2 cables KK02-221A	**0911 ANC 101**	Lumberg
	1 cable KK02-222A	**0911 ANC 408**	Lumberg

Please contact Fuji's Distributors for the purchase of connectors, etc.

■ Connectors for FE16D AS-i motor starter slave

Description			Type	Applicable cable diameter in mm	Manufacturer
ACIN use	Han3A internal socket, female	KK02-201A	**09200032711**	6.5 to 12	Harting
	Metal cover, top	KK02-202A	**09200031440**		
	Seal screw (M3)	KK02-203A	**09200009918**		
	Cable sealing parts (metal nut)	KK02-204A	**09000005013**		
MOTOROUT use	HanQ5/0 internal socket, male	KK02-205A	**09120053001**	6.5 to 12	
	Metal cover, top	KK02-202A	**09200031440**		
	Seal screw (M3)	KK02-203A	**09200009918**		
	Cable sealing parts (metal nut)	KK02-204A	**09000005013**		
	Plug pin, male ($2.5mm^2$)	KK02-203A	**09330006102**		
ACOUT use	Han3A internal socket, male	KK02-206A	**09200032611**	6.5 to 12	
	Metal cover, top	KK02-202A	**09200031440**		
	Seal screw (M3)	KK02-203A	**09200009918**		
	Cable sealing parts (metal nut)	KK02-204A	**09000005013**		
Waterproof cover	Metal cover internal element socket	 KK02-207A	**09000035425**	—	
Crimping tool	Crimping pliers (for plug pins)	KK02-200A	**09990000021**		

Please contact Fuji's Distributors for the purchase of connectors, etc.

AS-i conformed signal tower

■ Description

AS-i-compatible multi-layer signal light for open field networks

- Connects directly to existing AS-interfaces where sensors and switches are connected, thus eliminating the need for the use of dedicated I/O terminals.
- A flexible connection method ensures easy wiring during installation or modification and provides a variety of wire-reducing effects.
- The AS-i power supply type is driven by a power supply and data communications signals through a special AS-i two-core parallel flat cable (yellow). This type is suitable for small-scale installations and equipment.
- In comparatively large-scale installations, where a large number of devices are connected via AS-i, the power requirement may exceed the capacity of the AS-i power supply. In such cases, the auxiliary power supply type is ideal for providing power (24V DC) to the display and buzzer blocks from an external power source.
- Address settings are written to the internal EEPROM through a dedicated addressing unit (sold separately).
- In order to turn on signals, devices such as a PLC-mounted AS-i master, ASI power supply, and gateway connectable to the host network are necessary.
- Fixed output bits correspond to the respective unit colors, thus keeping the light colors unchanged regardless of changes in the color arrangement.
- An integrated electronic buzzer (in the B type) that is gentle to the ear provides a repetitive single-tone beep (85dB at 1m). The sound volume is adjustable in a wide range.
- In order to operate network-compatible products, network-supporting devices, such as a controller and accessories are required.

Double-reflection system

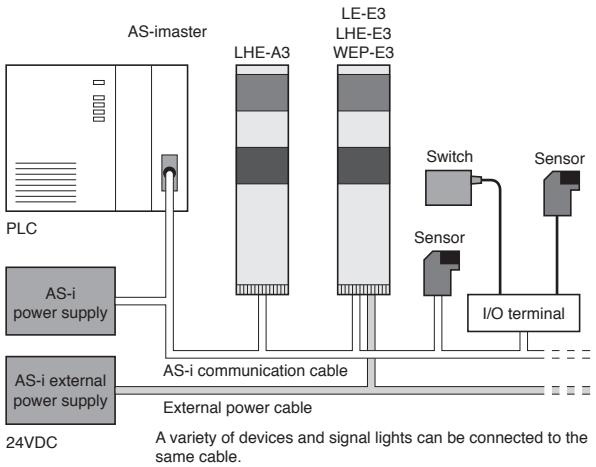
Steady brightness is ensured by the unique double-reflection structure, a lens-cut globe, and ultrahigh intensity LED unit.

Mounting bracket
SZ-012
(Included with pole-mounting type)

LE-E3P
LE-E3BP

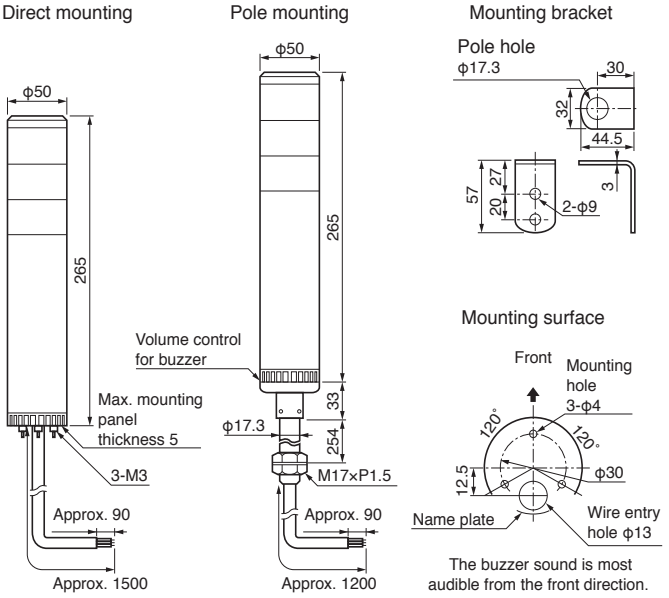
LE-E3W
LE-E3BW

■ AS-i Connection Concept



A variety of devices and signal lights can be connected to the same cable.
The LHE type is controlled with the AS-i power supply only.
Other types require an external power supply.

■ Dimensions, mm



Cable color	
Brown	AS-i +
Blue	AS-i -
White	EXternal power supply 24V DC
Black	EXternal power supply 0V

- An M12 plug and branch connector are used to connect to the AS-i cable.

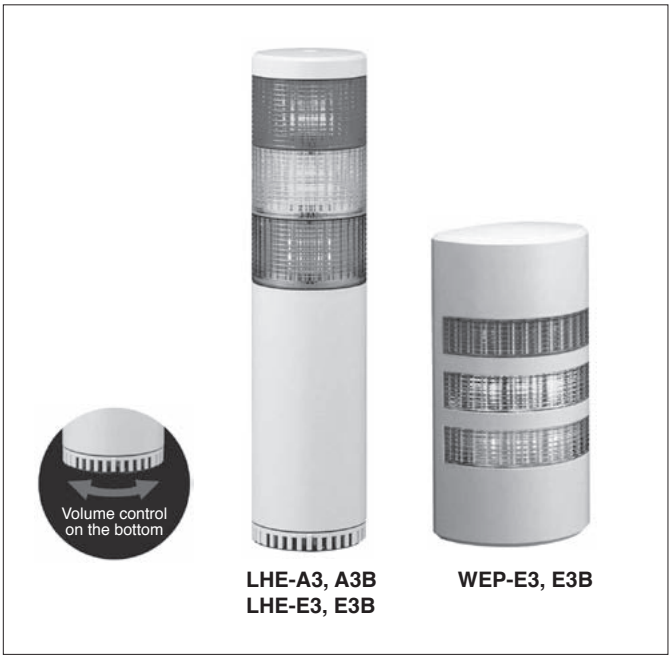
■ Optional accessories

Mounting bracket
SZ-011
Aluminum die-cast
Silver colored coating

Mounting bracket
SZ-014
Copper plate
Light gray coating

■ Description

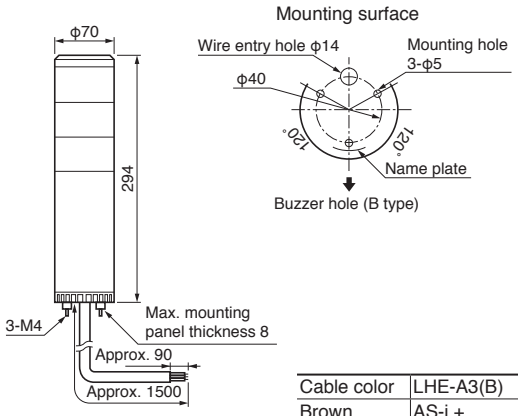
- An integrated electronic buzzer that is gentle to the ear is provided in the B type.
- The A3 type provides a single-tone beep (90dB at 1m), and the E3 type provides a repetitive beep (90dB at 1m). The sound volume is adjustable in wide range.
- Fixed output bits correspond to the respective unit colors, thus keeping the light colors unchanged regardless of changes in the color arrangement.
- Fuji Electric's newly developed LED reflection system (patent pending) efficiently reflects light and provides bright, excellent visibility.
- A buzzer with a single tone only is incorporated in the B type.
- The thin 37.5mm design allows easy integration with applicable equipment.
- The unique LED irradiation structure ensures high visibility even from the sides.



LHE-A3, A3B
LHE-E3, E3B

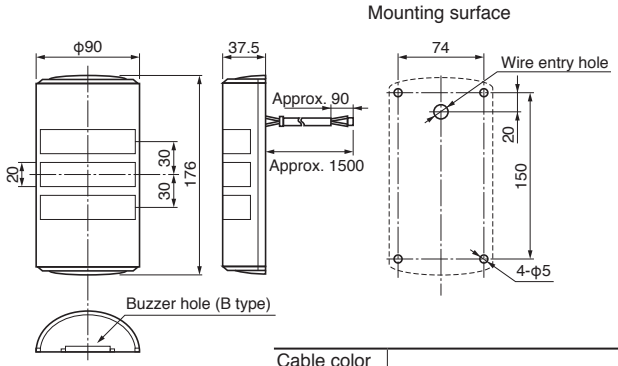
WEP-E3, E3B

■ Dimensions, mm



Cable color	LHE-A3(B)	LHE-E3(B)
Brown	AS-i +	AS-i +
Blue	AS-i -	AS-i -
White	—	EXternal power supply 24V DC
Black	—	EXternal power supply 0V

- An M12 plug and branch connector are used to connect to the AS-i cable.



Cable color	
Brown	AS-i +
Blue	AS-i -
White	EXternal power supply 24V DC
Black	EXternal power supply 0V

* For B type units, make sure that the buzzer hole downward.

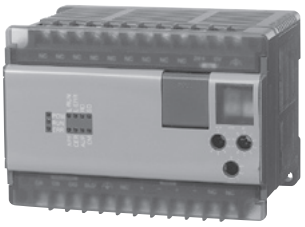
■ AS-i LED type

No. of stacks	Power supply method with LED indication part	Type		Buzzer	AS-i power supply	External power supply	Current consumption	
		Direct mounting	Pole mounting				AS-i communications only (Max.)	LED stacks, buzzer (Max.)
3-light	External power supply	LE-E3W LE-E3BW	LE-E3P LE-E3BP	None With	30V (AS-i +, AS-i -)	24V DC	60mA	25mA (red, yellow), 20mA (green) 40mA (buzzer)
	AS-i power supply	LHE-A3 LHE-A3B	— —	None With	30V (AS-i +, AS-i -)	—	60mA	50mA (red, yellow), 40mA (green) 40mA (buzzer)
	External power supply	LHE-E3 LHE-E3B WEP-E3 WEP-E3B	— — — —	None With None With	30V (AS-i +, AS-i -)	24V DC	60mA	50mA (red, yellow), 40mA (green) 40mA (buzzer) 30mA (red, yellow), 25mA (green) 40mA (buzzer)

■ Contact

Patlite Corporation.
International Div., Sales and Marketing Dept.
Tel: +81-729-48-3211 URL: http://www.patlite.co.jp/int/
Fax: +81-729-48-5533 E-mail: overseas@patlite.co.jp

CC-Link/AS-i gateway



KK02-170

■ Description

This product is a gateway that converts the CC-Link protocol into the AS-i protocol and vice versa.

- Incorporates an LED indicator to display the AS-i status (e.g., slave dropout, AS-i power supply error, and auto address setting availability).
- The 7-segment LED indicator displays the addresses of slaves dropping out (while in protect mode) and configuration slave addresses (while in configuration mode).
- The slave configuration is registered with the pushbuttonswitch on the front panel of the module.
- AS-i specifications: V2.04.

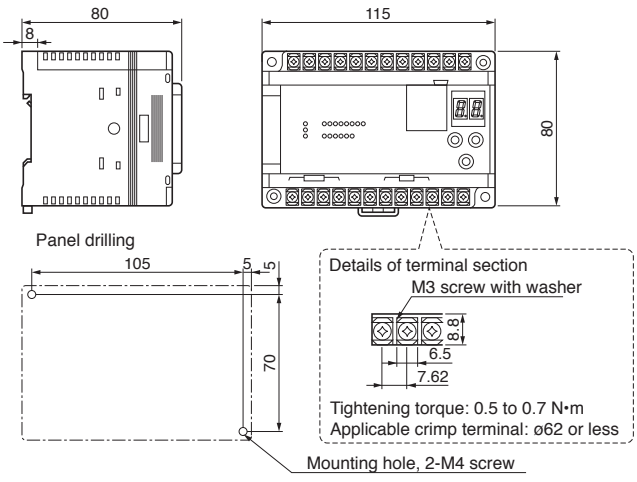
■ General specifications

Type	HK-ASICC
Supply voltage	24V DC
Voltage range	19 to 30V DC
Power consumption	Max. 3W
Inrush current	Approx. 3.8A
Structure	Installation inside panel (Natural cooling)
Operating temperature	0 to +55 ˚C
Relative humidity	20 to 90 % RH (no condensation)
Storage temperature	-20 to + 70 ˚C
Atmosphere	No corrosive gases and massive dust
Vidration resistance	Crossover frequency 57Hz: 19.6m/s^2 (2G)
Shock resistance	Test method 1-No.3: 294m/s^2 (30G)
Dielectric strength	1500V AC for 1min, between terminals connected together and FG
Insulation resistance	5MΩ, between terminals connected together and FG
Noise immunity	1500V Rise time: 1ns, pulse with 1μs
Electrostatic discharge resistance	Contact discharge method: ± 6kV Aerial discharge method: ± 8kV
Mounting method	IEC rail/screw dual mounting
Mass	Approx. 320g

■ CC-Link communications

Communication speed	10Mbps, 5Mbps, 2.5Mbps, 625kbps, 156kbps (SW changeable)					
Communication system	Broadcast polling system					
Synchronization system	Bit synchronization system					
Encoding system	NRZI					
Transmission path format	RS485 bus					
Transmission format	HDLC conformance					
Remote station number	1-64 (SW changeable)					
Error control system	CRC ($X^{16}+X^{12}+X^5+1$)					
RAS function	Communications error detection (CRC error, abort error)					
Connection cable	Shielded twisted pair cable					
Max. overall cable extension length	Transmission speed (bps)	10M	5M	2.5M	625k	156k
	Cable length (m)	100	150	200	600	1200
Terminating resistor	110Ω					
No. of occupied stations	2					
Occupied area	Remote input: RX Remote output: RY		64 points (64 bits), 16 points: System area			
	Remote Register	M→R : RWw R→M : RWr	8 points (8 words)			

■ Dimensions, mm



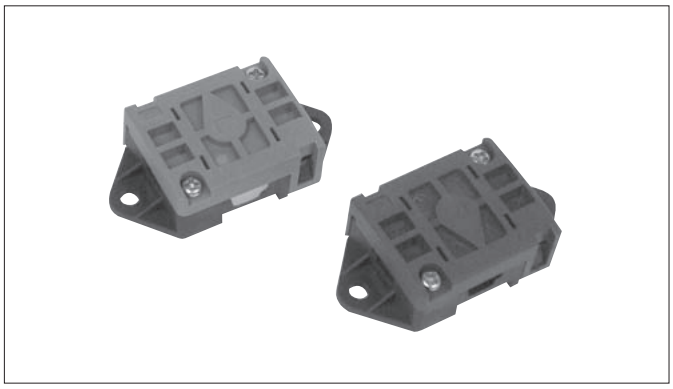
■ AS-i communications

Max. connectable slaves	31 (with addresses from 1 to 31)
Max. No. of I/O points	Max. points per slave: 4 inputs, 4 outputs
Max. cable length	248 points (Max. 124 inputs, Max. 124 outputs)
Cycle time	100m: Via AS-i cable (Max. 300m: Via Repeaters)
Transmission speed	5ms (with 31 slaves connected)
Transmission cable	AS-i cable (yellow) or parallel cable, also used as power cable
Power supply for communication	Use of AS-i power supply

■ Contact

Hakko Electronics Co., Ltd.
Technical Support Section
Fax: +81-76-274-5210

T-branch connector



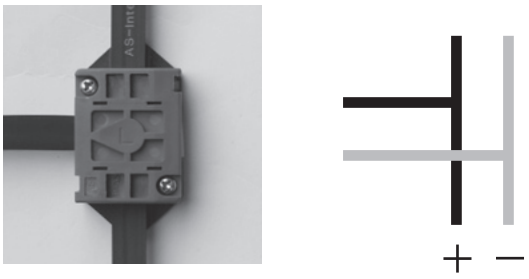
■ Features
- Reliable connection using piercing technology
- No special tools required
  All that is required is a Phillips screwdriver.
- Degree of protection: IP65 (Waterproof)
- Asymmetrical cables prevent misconnection.

■ Application
- AS-i communication cable (yellow) branch
- AS-i external power cable (black) branch

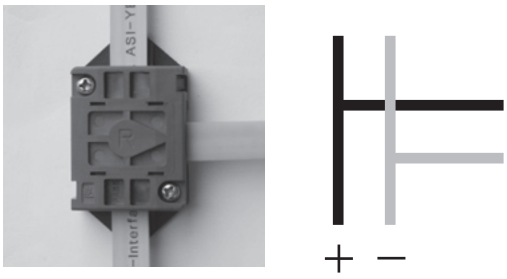
■ Specifications

Type	**ASD-OIL-BC-L2** For left-branch	**ASD-OIL-BC-R1** For right-branch
Rated current	7.2 A, max	
Dielectric strength	1500 Vr.m.s AC (1min.)	
Insulation resistance	100MΩ or more	
Low-level resistor	ΔR20m. Ω or more	
Applicable wire	AS-Interface cable	
Operating temperature	-40 to +85˚C	

■ Circuit
Left-branch : **ASD-01L-BC-L2**



Right-branch : **ASD-01L-BC-R1**



■ Contact
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3-5, Funado 2, Itabashi-ku, Tokyo 174-0041, Japan
Phone +81-3-3558-5746

■ AS-Interface Association - AS-i worldwide
Germany Tel: +49-60 51 - 47 32 12
Fax: +49-60 51 - 47 32 82
URL: www.as-interface.net
e-mail: info@as-interface.net
Japan Tel: +81-3-5795-1270
Fax: +81-3-5795-1280
URL: http://www.as-i.jp
E-mail: info@as-i.jp

Limit switches, AL and K244 series

■ Description

FUJI AL and K244 series limit switches have wide application in such industrial equipment as machine tools, printing machines, and transfer machines. These switches feature a sturdy aluminum die-cast housing that is highly resistant to oil, water, and dust, and long mechanical life — 10 million operations minimum.

AL series

AL and AL-S series limit switches feature a forced contact opening mechanism.
Under abnormal conditions, the mechanism forces the contacts open to prevent pitting and fusing.
Gold-plated silver contacts with scrubbing action have high reliability.

SI-1020

AL-SK

SF-2025

K244-xP-2

SK-580

K244-gR-2

K244 series

The K244 series is provided with four kinds of contact operating action: standard normal stroke, snap action, make-before-break, and extended stroke.
WK244 of the K244 series has bifurcated contacts, while HK244 features a scrubbing action mechanism. These limit switches can be used in low-level circuits of 3V, 5mA.

■ Selection guide

Basic type	**AL** Standard	**AL-S** Compact type	**K244** Standard	**HK244** For low-level circuit	**WK244** For low-level circuit
Rated voltage (max.)	550V AC, 250V DC*1		550V AC/DC		
Rated thermal current	10A (5A*1)		10A		
Operating cycles per hour	7,200		3,000		
Expected life (operations) Mechanical Electrical	10 millions 100,000 (at 125V AC, 5A res. load for snap action type)		10 millions 1 million*2 (at 220V AC, 10A res. load)	10 millions 400,000 (at 220V AC, 10A res. load)	10 millions 500,000 (at 220V AC, 2.5A res. load)
Contact arrangement	1NO+1NC		1NO+1NC, 2NO+2NC		
Contact	Single button		Single button		Bifurcated
Degree of protection (IEC)	IP67		–		
Features	Forced contact opening mechanism as standard Highly reliable gold-plated silver contacts		A wide variety of contact operating action Sealed types for oily and wet environments		
Page	*05/99*		*05/113*	*05/120*	*05/120*

*1: For snap action type
*2: 400,000 for snap action type

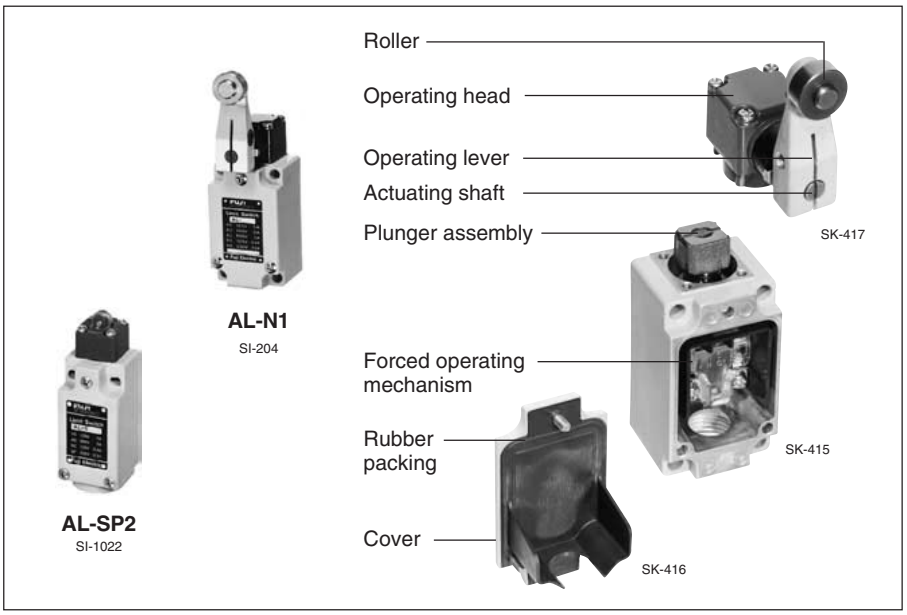
Forced contact opening limit switches, AL and AL-S series

■ Description

The AL and AL-S series limit switches feature a forced contact opening mechanism. This mechanism prevents contact welding and subsequent malfunctioning. These series therefore result in extremely dependable system controls.
The AL series is available in standard sizes and the AL-S series is compact versions of the AL types.

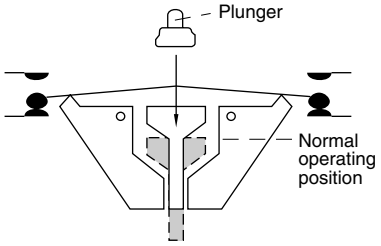
■ Features

- The forced contact opening mechanism is provided so as to overcome contact problems.
- Gold-plated contacts and a self cleaning action ensure contact reliability.
- Sealed construction
  Double oil seals prevent moving parts and contacts from being contaminated by exterior oil, grime and grease, an advantage in dirty industrial locations.
- Operational mode indicator can replace existing cover with lamp indicator cover when required.
  An LED or neon lamp is used depending on supply voltage.
- Contact mechanical design
  Contact operating mechanisms can be selected according to the application-snap, overlap and normal actions
- Conform to IEC Standard



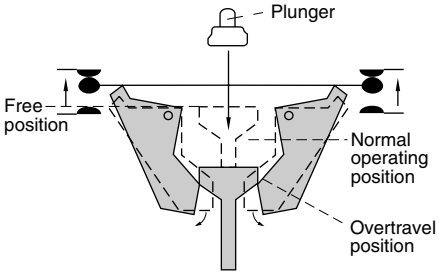
■ Forced contact opening mechanism

This mechanism does not operate under normal conditions. However, when the switch plunger overtravels under abnormal conditions the mehcanism comes into operation and forcibily opens the NC contacts thus preventing contact welding.
This action improves the dependability of electrical systems.



Switching is carried out at the normal operating position

Normal operating condition



The mechanism operates to open the contacts when the plunger overtravels

Abnormal condition

■ Contact ratings

Contact action	Thermal current (A)	Make and break current * AC Voltage (V)	Resistive (A)	Inductive (A)	DC Voltage (V)	Resistive (A)	Inductive (A)
Snap	5	125	5	3	30 or less	5	3
		250	3	2	125	0.4	0.05
		500	1	0.6	250	0.2	0.03
Normal Overlap	10	24	10	10	24	7	7
		110	10	10	110	1.5	0.9
		220	10	10	220	0.63	0.28
		440	5	5	440	0.28	0.14
		550	3	3	550	0.22	0.1

*: When NO and NC contacts are wired in the same potential.

■ UL listed (File No. E44592)
Contact ratings

AC (B300) Voltage (V)	Operational current (A) Make	Break	DC Voltage (V)	Operational current (Res. load) (A)
120	30	3	30	5
240	15	1.5	125	0.4
			250	0.2

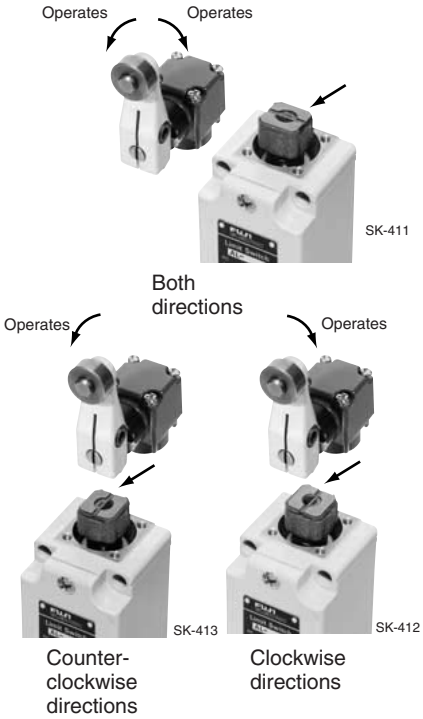
■ Technical data

Insulation resistance:
Over 100MΩ at 500V DC
Life expectancy
Mechanical: Over 10 million operations
Electrical: Snap action type
100,000 operations at
125V AC 5A res. load
Normal action type
100,000 operations at
110V AC 10A res. load
Allowable ambient temperature:
–10°C to +80°C
Degree of protection: IEC IP67

■ Directional contact operation

AL-N1, AL-N2 and AL-N3 can be modified in their operational directions. They will switch in both directions, or in only one direction, either clockwise or counterclockwise. The adjustment is easily carried out by removing the operating head and changing the plunger as shown in the photograph. After the plunger has been reassembled, replace the head and tighten the screws. Check operation by moving the arm in the desired direction.

Standard operating position

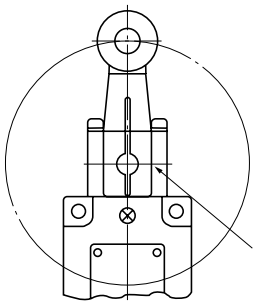


■ Changing direction of operating head

The operating head direction can be changed through 90° after having removed the screw. Care must be taken because the contact action changes according to the direction of the plunger assembly. Check for correct assembly after each step has been completed. Limit switches with adjustable head direction are AL-N1, AL-N2, AL-N3, AL-SN1, AL-SN2 and AL-SN3. In the case of AL-P2 and AL-SP2, the head direction of a top push roller plunger type can be shifted 90° in either direction.

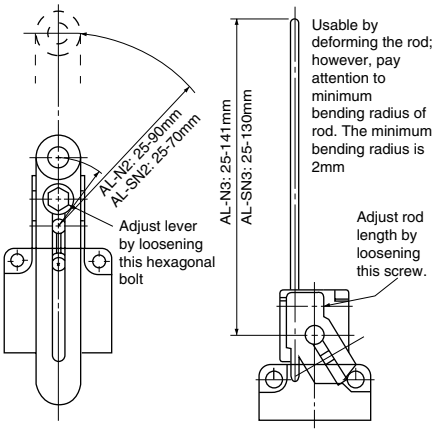
■ Adjustment of operating lever

Loosen the locking screw, turn over the lever and then retighten at the required position.
Type:
AL-N1, AL-N2, AL-N3, AL-SN1, AL-SN2, AL-SN3, AL-F1.

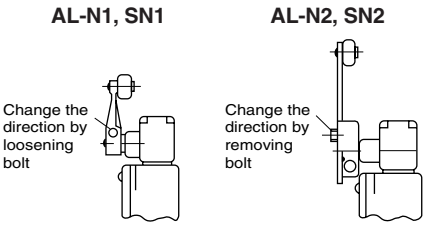


■ Adjustment of lever length

Loosen the adjustment screw, adjust the length and retighten.


AL-N2: 25-90mm
AL-SN2: 25-70mm
Adjust lever by loosening this hexagonal bolt
AL-N3: 25-141mm
AL-SN3: 25-130mm
Usable by deforming the rod; however, pay attention to minimum bending radius of rod. The minimum bending radius is 2mm
Adjust rod length by loosening this screw.
AL-N2
AL-SN2
AL-N3
AL-SN3

■ Roller installable on inner side



■ Dimensions:

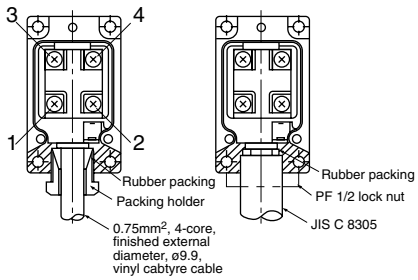
See pages 05/110 to 05/112.

■ Ordering information

Specify the following:
1. Type number or ordering code

■ Cable connection

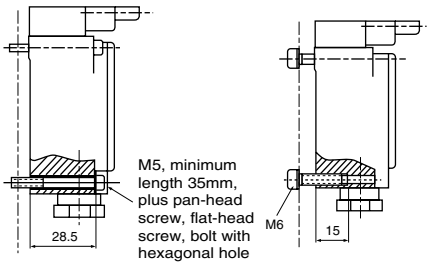
Refer to the wiring diagram for connection.
When connecting to conduit remove the plastic packing piece.



Contact: 1-2 Normally closed
3-4 Normally open

■ Mounting

AL type limit switches can be attached either from the front or the back. In the case of front mounting type clamp at 4 positions using M5 screws. When attaching from the back of the panel tighten at 4 positions by means of M6 screws.
The thread depth of the switch body is 15mm.



Front mounting
Rear mounting

■ Type number nomenclature

AL–N1 1 H1 UL

UL approved

Lamp voltage
A2 : 5 to 8V (LED)
B2 : 10 to 15V (LED)
E2 : 18 to 24V (LED)
H1 : 110 to 220V (Neon)

Contact action
1 : Snap action
2 : Normal action
3 : Overlap action
1S : Snap action (Sealed contact)

Type of actuator
N1 : Roller lever
N2 : Adjustable length roller lever
N3 : Adjustable length rod lever
P1 : Top push rod plunger
P2 : Top push roller plunger
P3 : Top ball push rod plunger
F1 : Fork roller lever
S1 : Wobble head coil spring rod
S2 : Wobble plastic head spring rod
W1 : Wobble head with cat's whisker
Y1 : Side push rod plunger
Y2 : Side push roller plunger
Y3 : Side ball push rod plunger

AL : Standard type
AL-S : Compact type

■ Ordering code

PL 1 A–1 A ZU

UL approved

Lamp voltage
A : LED 5 to 8V
B : LED 10 to 15V
E : LED 18 to 24V
D : Neon

Contact action
1 : Snap action
2 : Normal action
3 : Overlap action

Type of actuator
A : Roller lever
B : Adjustable length roller lever
C : Adjustable length rod lever
D : Top push rod plunger
E : Top push roller plunger
F : Top ball push rod plunger
G : Fork roller lever
H : Wobble head coil spring rod
J : Wobble plastic head spring rod
K : Wobble head with cat's whisker
L : Side push rod plunger
M : Side push roller plunger
N : Side ball push rod plunger

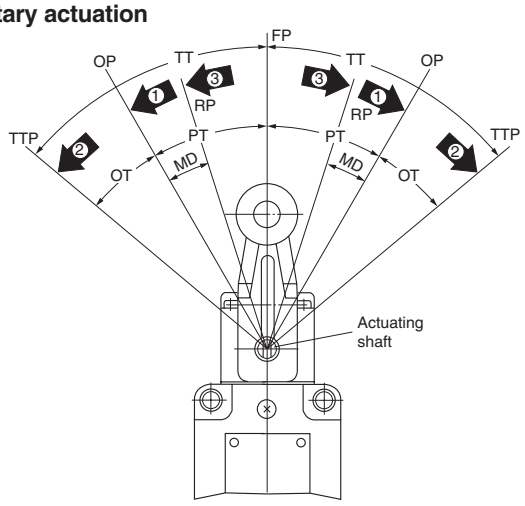
Series
1 : Standard type
2 : Compact type

Limit switch

05

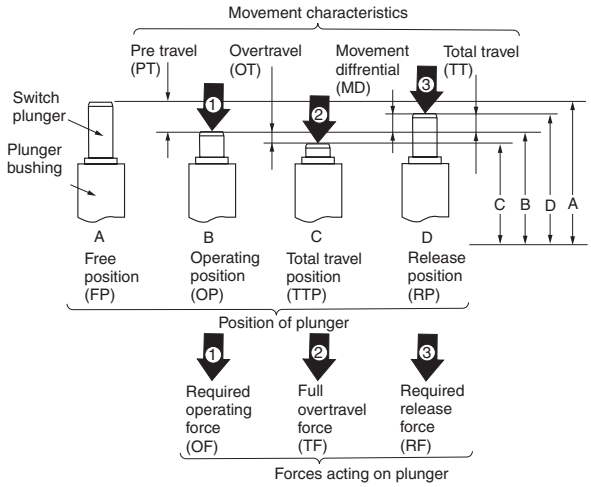
■ Operating and definitions (for snap action type)

• Rotary actuation



FP: Free Position
This is the position where there is no load on the actuator.
OP: Operating Position
This is the position where the actuator travels from the free position to NO contact closes.
TTP: Total Travel Position
This is the furthest position where the actuator can travel to after passing the OP without damage to the limit switch.
RP: Release Position
This is the position where the contact resets after the actuator has travelled from OP.
PT: Preoperating Travel
This indicates the travelling angle or distance from FP to OP.
OT: Overtravel
This indicates the travelling angle or distance from OP to TTP.

• Plunger actuation



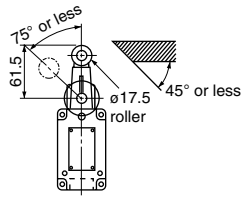
TT: Total Travel
This indicates the travelling angle or distance from FP to TTP.
MD: Movement Differential (Travel to Reset)
This indicates the travelling angle or distance from OP to the position where the contact resets.
OF: Required Operating Force ①
This indicates the minimum operating force which is required for the contact to close.
RF: Required Resetting Force ③
This indicates the force required for the contact to reset.
TF: Full Overtravel Force ②
This indicates the force required for the actuator to travel from FP to TTP.

■ Actuating slider face angle and approach speed

● Standard type

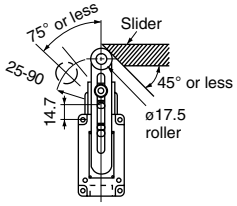
Type		AL-N1		AL-N2		AL-N3	AL-F1	AL-S1	AL-P1	AL-P2	AL-P3
Slider angle (degree)		30	45	30	45	—	45	—	—	30	30
Slider approach speed	Maximum (meter/second)	0.5	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.3	0.3
	Minimum (millimeter/second)	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1

AL-N1



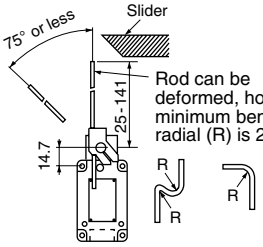
AL-N2

Determine slider depth within range of these dimensions

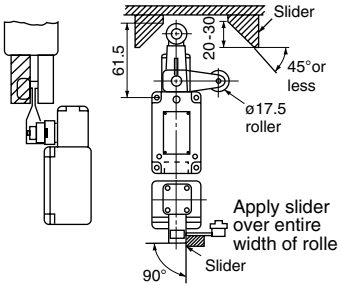


AL-N3

Determine slider depth within range of these dimensions

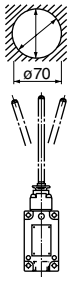


AL-F1

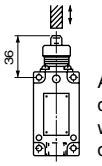


AL-S1

When actuating switch beyond this range, contact may make/break two times or more

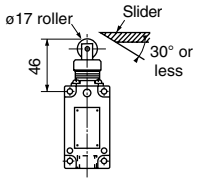


AL-P1

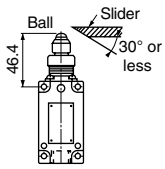


Actuate AL-P1 type in direction coinciding with plunger shaft direction

AL-P2



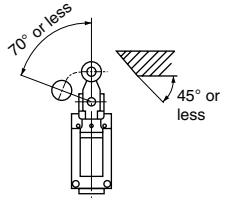
AL-P3



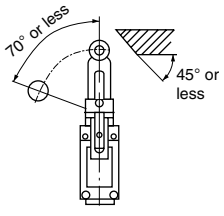
● Compact type

Type		AL-SN1		AL-SN2		AL-SN3	AL-SK1	AL-SK2	AL-SS1	AL-SP1	AL-SP2
Slider angle (degree)		30	45	30	45	—	30	45	—	—	30
Slider approach speed	Maximum (meter/second)	0.5	0.2	0.2	0.1	0.2	υ_1: 0.6 υ_2: 0.2	0.5 —	0.2	0.2	0.3
	Minimum (millimeter/second)	0.1	0.1	0.2	0.2	0.2	υ_1: 0.1 υ_2: 0.1	0.1 —	0.2	0.1	0.1

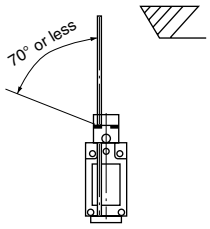
AL-SN1



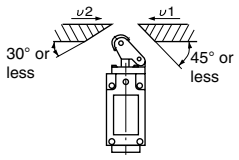
AL-SN2



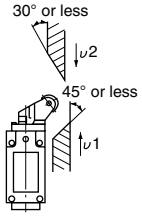
AL-SN3



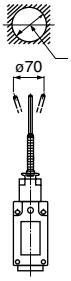
AL-SK1



AL-SK2

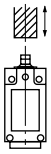


AL-SS1



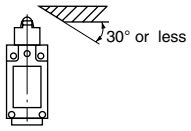
When actuating switch beyond this range, contact may make/break two times or more

AL-SP1



Actuate AL-SP1 type in direction coinciding with plunger shaft direction

AL-SP2



■ AL series

Description

SI-204

Roller lever
- The angle from the free position to the maximum travel position is 75°
- Spring return
- The most popular limit switch which is best suited for machine tools, automatic machines, conveyor control and similar applications.

Type	Ordering code
AL-N11	PL1A-1
AL-N12	PL1A-2
AL-N13	PL1A-3
AL-N11UL	PL1A-1ZU

SI-203

Adjustable length roller lever
- The lever length can be adjusted between 25mm and 90mm.
- Spring return
- The graduated scales on the lever facilitate adjustment

Type	Ordering code
AL-N21	PL1B-1
AL-N22	PL1B-2
AL-N23	PL1B-3
AL-N21UL	PL1B-1ZU

SI-202

Adjustable length rod lever
- The ø3.2mm stainless steel rod can be extended up to 141mm max.
- Spring return
- The rod can be used by bending. (Radial 2mm min.)

Type	Ordering code
AL-N31	PL1C-1
AL-N32	PL1C-2
AL-N33	PL1C-3
AL-N31UL	PL1C-1ZU

SI-209

Top push rod plunger
- Operated by a vertical rod plunger
- Momentary action

Type	Ordering code
AL-P11	PL1D-1
AL-P12	PL1D-2
AL-P13	PL1D-3
AL-P11UL	PL1D-1ZU

SI-207

Top push roller plunger
- This is a limit switch where the roller is attached to the plunger.
- The direction of the roller can be shifted 90°.
- This feature makes it highly suitable for the control of precision machinery.
- Momentary action

Type	Ordering code
AL-P21	PL1E-1
AL-P22	PL1E-2
AL-P23	PL1E-3
AL-P21UL	PL1E-1ZU

Description

SI-208

Top ball push rod plunger
- The ball rod can be operated from any direction.
- The ball turns smoothly at all times.
- Best suited for detecting objects which travel horizontally from left to right or right to left while turning.

Type	Ordering code
AL-P31	PL1F-1
AL-P32	PL1F-2
PL-P33	PL1F-3
AL-P31UL	PL1F-1ZU

SI-205

Fork roller lever
- The angle of the lever is 90°
- Maintained
- This limit switch is used when detecting the direction in which the lever inclines — i.e. in the right or left.

Type	Ordering code
AL-F11	PL1G-1
AL-F11UL	PL1G-1ZU

SI-211

Side push rod plunger
- Push rod is attached to the side of the operating head.
- The operating head can be changed 90° in direction.
- Momentary action
- This limit switch is used to detect the end limit of low speed transfer.

Type	Ordering code
AL-Y11	PL1H-1
AL-Y11UL	PL1H-1ZU

SI-212

Side push roller plunger
- The push roller is attached to the side of the operating head.
- Momentary action
- This is used to detect the position, speed and direction in high precision machinery and equipment.

Type	Ordering code
AL-Y21	PL1J-1
AL-Y21UL	PL1J-1ZU

SI-210

Side ball push rod plunger
- The ball rod is attached to the side of the operating head.
- The ball turns smoothly in operation.
- Momentary action
- This limit switch is used to detect objects which travel horizontally from left to right or right to left while turning.

Type	Ordering code
AL-Y31	PL1K-1
AL-Y31UL	PL1K-1ZU

05

■ AL series

Description

SI-200

Wobble head coil spring rod
- Operates by forces from any directions.
- Used in packing and other conveyors.

Type	Ordering code
AL-S11	PL1H-1
AL-S11UL	PL1H-1ZU

Wobble plastic head spring rod
- The length of rod is 140mm from the head.
- Operates by forces from any directions.

SI-201

Type	Ordering code
AL-S21	PL1M-1
AL-S21UL	PL1M-1ZU

Description

SI-199

Wobble head with cat's whisker
- The length of the stainless steel rod is 190mm from the head.
- Can be operated from any direction.
- Require little torque

Type	Ordering code
AL-W11	PL1N-1
AL-W11UL	PL1N-1ZU

■ Operating characteristics

Standard type (Snap action)

Type	**AL-N11** **AL-N11S**	**AL-N21**[*1] **AL-N21S**[*1]	**AL-N31**[*2] **AL-N31S**[*2]	**AL-P11** **AL-P11S**	**AL-P21** **AL-P21S**	**AL-P31** **AL-P31S**	**AL-F11** **AL-F11S**
Required operating force OF (max.)	9N	9N	2.9N	15N	15N	15N	9.5N
Required resetting force RF (min.)	0.5N	0.5N	0.15N	8.2N	8.2N	8.2N	—
Preoperating travel PT (min.)	12°	12°	12°	2mm	2mm	2mm	55°
Overtravel OT (min.)	65°	65°	65°	5mm	5mm	5mm	35°
Movement differential (Travel to reset) MD (max.)	7°	7°	7°	1mm	1mm	1mm	—
Total travel TT (min.)	75°	75°	75°	—	—	—	90°±10°

Notes: [*1] At lever length 38mm
[*2] At rod lever length 135mm

Type	**AL-Y11** **AL-Y11S**	**AL-Y21** **AL-Y21S**	**AL-Y31** **AL-Y31S**	**AL-S11** **AL-S11S**	**AL-S21** **AL-S21S**	**AL-W11** **AL-W11S**
Required operating force OF (max.)	40N	40N	40N	1.5N	1.5N	1.5N
Required resetting force RF (min.)	8.9N	8.9N	8.9N	—	—	—
Preoperating travel PT (min.)	2.8mm	2.8mm	2.8mm	30mm	30mm	40mm
Overtravel OT (min.)	4mm	4mm	4mm	—	—	—
Movement differential (Travel to reset) MD (max.)	1mm	1mm	1mm	—	—	—

Standard type (Normal action, overlap action)

	Normal action			Overlap action		
Type	**AL-N12** [*1] **AL-N22**	**AL-N32** [*2]	**AL-P12** **AL-P22** **AL-P32AL**	**AL-N13** [*1] **AL-N23**	**AL-N33** [*2]	**AL-P13** **AL-P23** **AL-P33**
Required operating force OF (max.)	11N	3.1N	18N	11N	3.1N	18N
Movement to NC contact open	28˚	28˚	3.5mm	45˚	45˚	5mm
Movement to NO contact closed	45˚	45˚	5mm	28˚	28˚	3.5mm
Total travel TT (min., max.)	75˚	75˚	7mm	75˚	75˚	7mm

Notes: [*1] At lever length 38mm
[*2] At rod lever length 135mm

■ AL-S series/Compact-size

Description

SI-1023

Top push rod plunger
- Operated by a vertical rod plunger.
- Momentary action

Type	Ordering code
AL-SP11	PL2D-1
AL-SP12	PL2D-2
AL-SP13	PL2D-3
AL-SP11UL	PL2D-1ZU

SI-1022

Top push roller plunger
- This is a limit switch where the roller is attached to the plunger.
- The direction of the roller can be shifted 90°
- Momentary action

Type	Ordering code
AL-SP21	PL2E-1
AL-SP22	PL2E-2
AL-SP23	PL2E-3
AL-SP21UL	PL2E-1ZU

SI-1020

Top roller lever plunger
- This limit switch is used to detect objects which travel horizontally from left to right or right to left while turning.
- Used in packing and other conveyors.

Type	Ordering code
AL-SK11	PL2P-1
AL-SK12	PL2P-2
AL-SK13	PL2P-3
AL-SK11UL	PL2P-1ZU

SI-1021

Reversing top roller lever plunger
- This type is designed to detect the movements in the vertical direction.

Type	Ordering code
AL-SK21	PL2Q-1
AL-SK22	PL2Q-2
AL-SK23	PL2Q-3
AL-SK21UL	PL2Q-1ZU

Description

SI-1029

Roller lever
- The angle from the free position to the maximum travel position is 70°
- Spring return

Type	Ordering code
AL-SN11	PL2A-1
AL-SN11UL	PL2A-1ZU

SI-1018

Adjustable length roller lever
- The lever length can be adjusted between 25mm and 76mm.
- Spring return
- The graduated scales on the lever facilitate adjustment

Type	Ordering code
AL-SN21	PL2B-1
AL-SN21UL	PL2B-1ZU

SI-1027

Adjustable length rod lever
- The ø3.2mm stainless steel rod can be extended up to 130mm max.
- Spring return
- The rod can be used by bending. (Radial 2mm min.)

Type	Ordering code
AL-SN31	PL2C-1
AL-SN31UL	PL2C-1ZU

SI-1016

Wobble head coil spring rod
- The length of rod is 113mm from the head.
- Can be operated from any direction.
- Require little torque

Type	Ordering code
AL-SS11	PL2H-1
AL-SS11UL	PL2H-1ZU

■ Operating characteristics

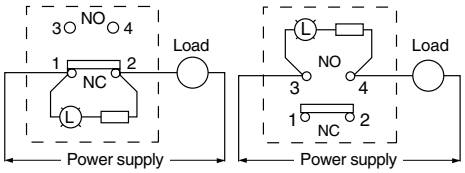
Compact type (Snap action)

Type	AL-SP11	AL-SP21	AL-SK11	AL-SK21	AL-SN11	AL-SN21 *1	AL-SN31 *1	AL-SS11
Required operating force OF (max.)	4.5N	8.5N	4N	4N	7N	7N	7N	1.5N
Required resetting force RF (min.)	2N	4.5N	1.8N	1.8N	0.5N	0.5N	0.5N	—
Preoperating travel PT (min.)	2mm	2mm	2.5mm	2.5mm	30°	30°	30°	30mm
Overtravel OT (min.)	4mm	3mm	5mm	5mm	40°	40°	40°	—
Movement differential (Travel to reset) MD (max.)	1mm	1mm	1.8mm	1.8mm	8°	8°	8°	—

Notes: *1 At lever or rod level length 25mm

Compact type (Normal action, overlap action)

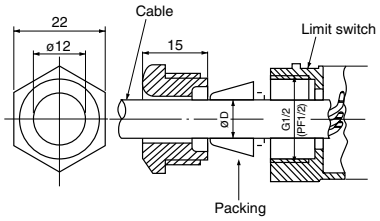
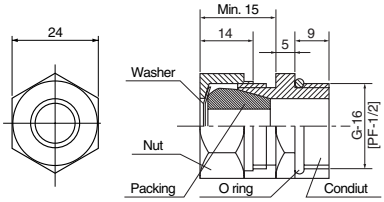
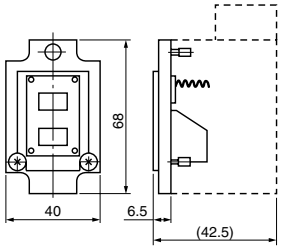
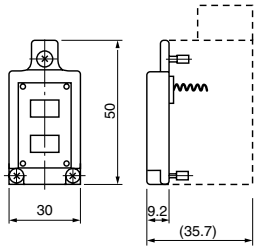
	Normal action			Overlap action		
Type	**AL-SP12**	**AL-SP22**	**AL-SK□2**	**AL-SP13**	**AL-SP23**	**AL-SK□3**
Required operating force OF (max.)	7N	10.5N	6.3N	7N	10.5N	6.3N
Movement to NC contact open	1.5mm	1.5mm	2mm	3mm	3mm	4mm
Movement to NO contact closed	3mm	3mm	4mm	1.5mm	1.5mm	2mm
Total travel TT (min., max.)	6mm	6mm	8mm	6mm	6mm	8mm

Description		Standard/Compact Type	Ordering code	UL approved Type	Ordering code
SI-314 Standard type	**With indicating lamp** • The indicating lamp can be fitted to all the AL limit switches. • Neon lamp or LED, and stabilizing resistor are attached inside the housing so that the lamp lights or goes out when the switch is operating. • The nylon cover makes the signal highly visible. • Indicating lamps do not affect the switch dimensions or operating characteristics. • The wiring connections for snap action type are shown below.	**AL-N1□■**	PL1A-□■	**AL-N11■UL**	PL1A-1■ZU
		AL-N2□■	PL1B-□■	**AL-N21■UL**	PL1B-1■ZU
		AL-N3□■	PL1C-□■	**AL-N31■UL**	PL1C-1■ZU
		AL-P1□■	PL1D-□■	**AL-P11■UL**	PL1D-1■ZU
		AL-P2□■	PL1E-□■	**AL-P21■UL**	PL1E-1■ZU
		AL-P3□■	PL1F-□■	**AL-P31■UL**	PL1F-1■ZU
		AL-F1□■	PL1G-□■	**AL-F11■UL**	PL1G-1■ZU
		AL-Y1□■	PL1L-□■	**AL-Y11■UL**	PL1L-1■ZU
		AL-Y2□■	PL1M-□■	**AL-Y21■UL**	PL1M-1■ZU
		AL-T3□■	PL1N-□■	**AL-T31■UL**	PL1N-1■ZU
		AL-S1□■	PL1H-□■	**AL-S11■UL**	PL1H-1■ZU
		AL-S2□■	PL1J-□■	**AL-S21■UL**	PL1J-1■ZU
		AL-W1□■	PL1K-□■	**AL-W11■UL**	PL1K-1■ZU
SI-1078 Compact type	 The lamp lights when NO contact closes. The lamp lights when NO contact opens.	**AL-SP1□■**	PL2D-□■	**AL-SP11■UL**	PL2D-1■ZU
		AL-SP2□■	PL2E-□■	**AL-SP11■UL**	PL2E-1■ZU
		AL-SK1□■	PL2P-□■	**AL-SK11■UL**	PL2P-1■ZU
		AL-SK2□■	PL2Q-□■	**AL-SK21■UL**	PL2Q-1■ZU
		AL-SN1□■	PL2A-□■	**AL-SN11■UL**	PL2A-1■ZU
		AL-SN2□■	PL2B-□■	**AL-SN21■UL**	PL2B-1■ZU
		AL-SN3□■	PL2C-□■	**AL-SN31■UL**	PL2C-1■ZU
		AL-SS1□■	PL2H-□■	**AL-SS11■UL**	PL2H-1■ZU

Replace the □ mark by the contact action code
Replace the ■ mark by the lamp voltage code

05

■ Accessories

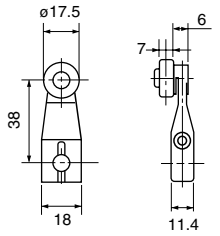
Description		Operating		Type	Ordering code
Standard type sealed conduit (Plastic)		Cable dia. (øD)	ø7.5 – ø11.5 (for AL type) ø7 – ø11 (for AL-S type)	**ALX-016** **ALX-510**	PL1XW-A PL1XW-B
Complete type sealed conduit (Metal)	 SI-233	Cable dia. (øD)	ø6 – ø9 ø8 – ø11 ø12 – ø14 (for AL type, AL-S type, AL1-S type)	**ALX-013** **ALX-014** **ALX-015**	PL1XW-C PL1XW-D PL1XW-E
Lamp cover for AL series	SI-232 	For snap action	LED lamp 6V DC LED lamp 12V DC LED lamp 24V DC Neon lamp 110/220V AC	**ALX-011A** **ALX-011B** **ALX-011E** **ALX-011H**	PL1XL-1A PL2XL-1B PL1XL-1C PL1XL-1D
		For normal action	LED lamp 6V DC LED lamp 12V DC LED lamp 24V DC Neon lamp 110/220V AC	**ALX-012A** **ALX-012B** **ALX-012E** **ALX-012H**	PL1XL-2A PL2XL-2B PL1XL-2C PL1XL-2D
Lamp cover for AL-S series	SI-350 	For snap action	LED lamp 6V DC LED lamp 12V DC LED lamp 24V DC Neon lamp 110/220V AC	**ALX-507A** **ALX-507B** **ALX-507E** **ALX-507H**	PL2XL-1A PL2XL-1B PL2XL-1C PL2XL-1D
		For normal action	LED lamp 6V DC LED lamp 12V DC LED lamp 24V DC Neon lamp 110/220V AC	**ALX-508A** **ALX-508B** **ALX-508E** **ALX-508H**	PL2XL-2A PL2XL-2B PL2XL-2C PL2XL-2D

■ Actuators

• For AL series

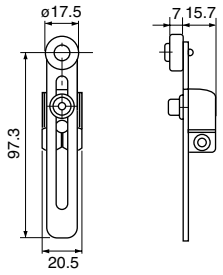
Description	Type	
Roller lever	**ALX-001**	Stainless steel roller

SI-177



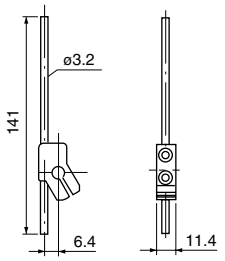
Adjustable length roller lever	**ALX-003**	Stainless steel roller

SI-173



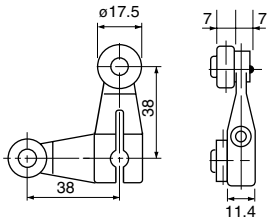
Adjustable length rod lever	**ALX-005**	Stainless steel rod

SI-171



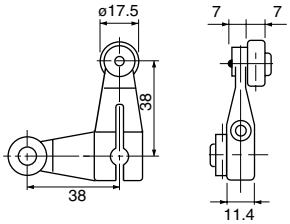
Fork roller lever	**ALX-007**	Stainless steel roller

SI-175



Fork roller lever	**ALX-009**	Stainless steel roller

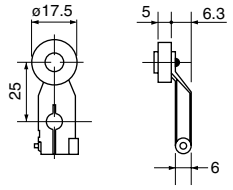
SI-176



• For AL-S series

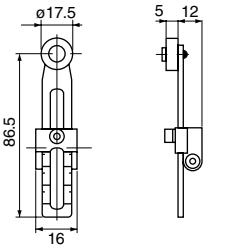
Description	Type	
Roller lever	**ALX-501**	Stainless steel roller

SI-316



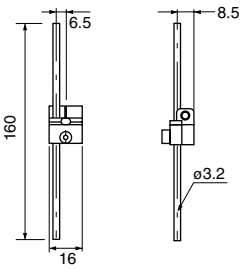
Adjustable length roller lever	**ALX-503**	Stainless steel roller

SI-174



Adjustable length rod lever	**ALX-505**	Stainless steel rod

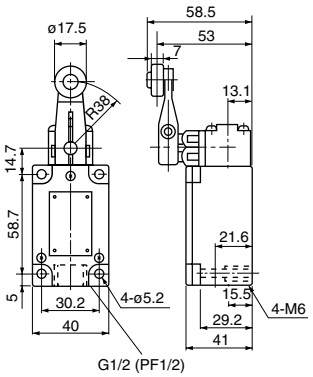
SI-172



05

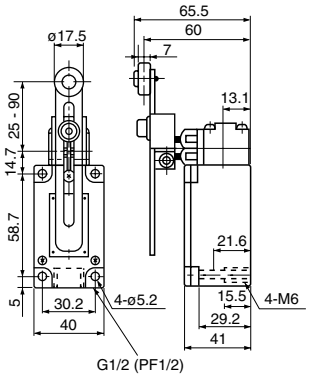
■ Dimensions, mm (AL series)

Roller lever
AL-N1



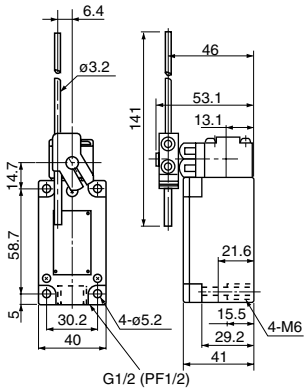
Mass: 265g — Stainless steel roller

Adjustable length roller lever
AL-N2



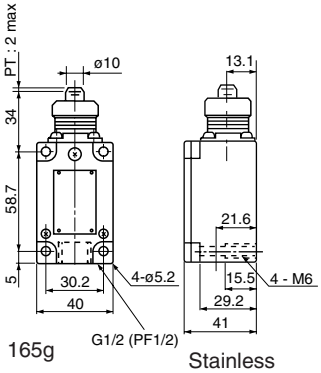
Mass: 305g — Stainless steel roller

Adjustable length rod lever
AL-N3



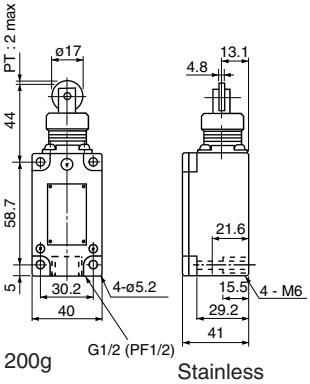
Mass: 260g — Stainless steel rod

Top push rod plunger
AL-P1



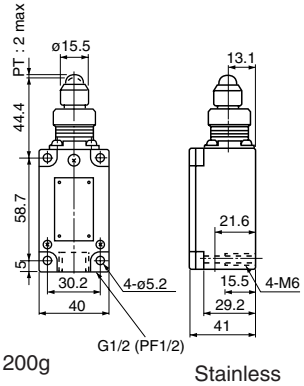
Mass: 165g — Stainless steel plunger

Top push roller plunger
AL-P2



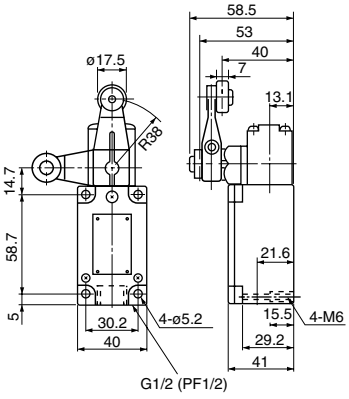
Mass: 200g — Stainless steel roller

Top ball push rod plunger
AL-P3



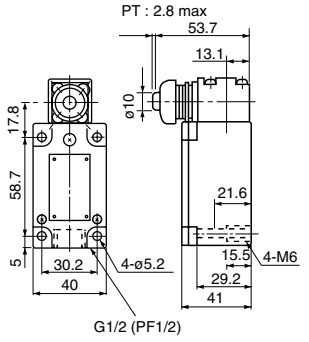
Mass: 200g — Stainless steel ball

Fork roller lever
AL-F1



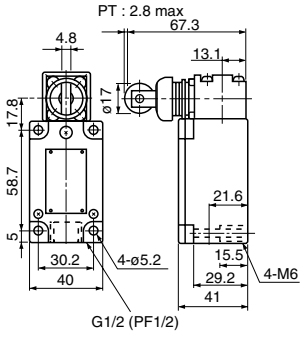
Mass: 310g — Stainless steel roller

Side push rod plunger
AL-Y1



Mass: 275g — Stainless steel plunger

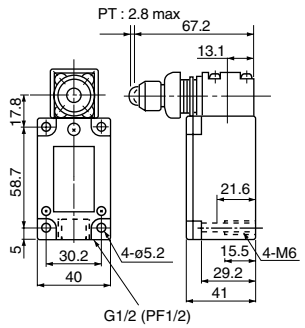
Side push roller plunger
AL-Y2



Mass: 285g — Stainless steel roller

■ Dimensions, mm (AL series)

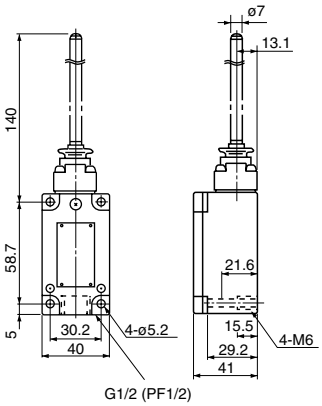
Side ball push rod plunger
AL-Y3



Mass: 285g

Stainless steel ball

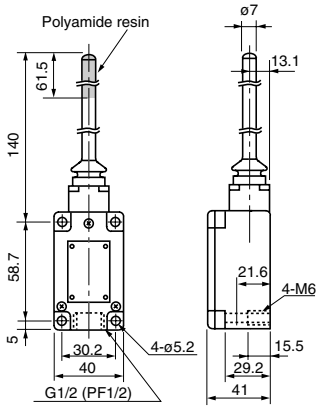
Wobble head coil spring rod
AL-S1



Mass: 220g

Stainless steel coil spring

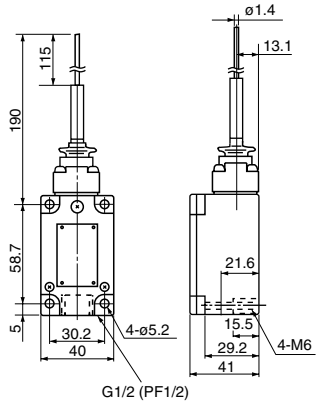
Wobble plastic head spring rod
AL-S2



Mass: 210g

Stainless steel coil spring

Wobble head with cat's whisker
AL-W1



Mass: 210g

Stainless steel coil spring

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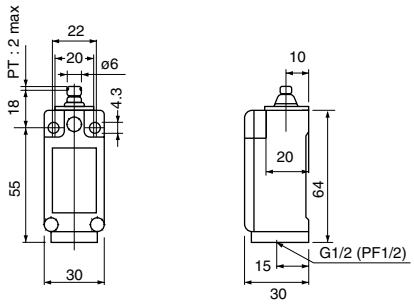
■ Dimensions, mm (AL-S series/Compact size)

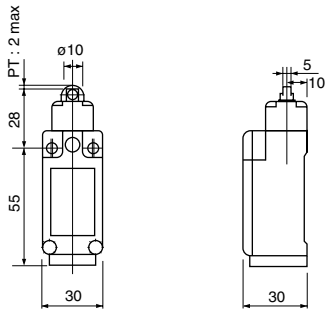
Top push rod plunger
AL-SP1



Mass: 55g

Polyamide resin plunger

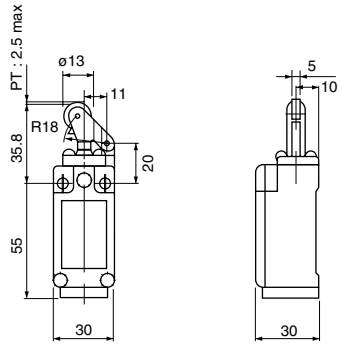
Top push roller plunger
AL-SP2



Mass: 60g

Stainless steel roller

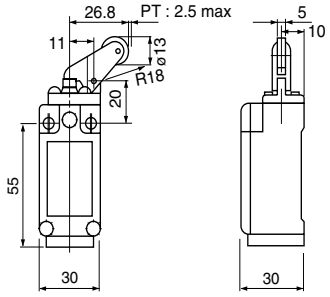
Top roller lever plunger
AL-SK1



Mass: 65g

Stainless steel roller

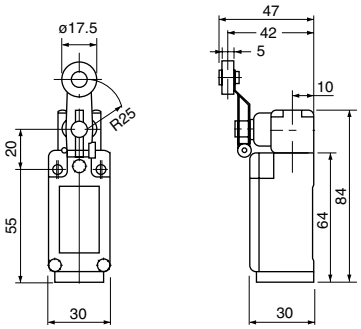
Reversing top roller lever plunger
AL-SK2



Mass: 65g

Stainless steel roller

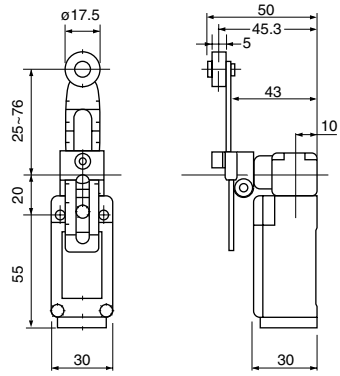
Roller lever
AL-SN1



Mass: 100g

Stainless steel roller

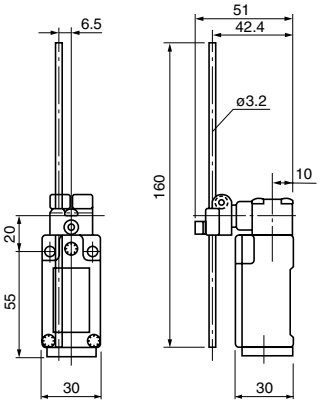
Adjustable length roller lever
AL-SN2



Mass: 120g

Stainless steel roller

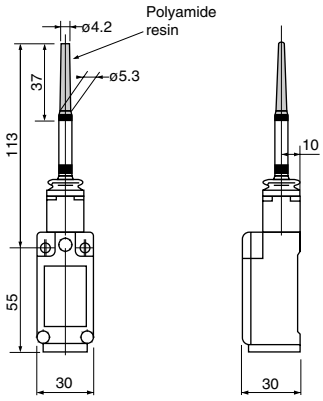
Adjustable length rod lever
AL-SN3



Mass: 105g

Stainless steel rod

Wobble plastic head spring rod
AL-SS1



Mass: 80g

Stainless steel coil spring

Momentary-contact limit switches K244 series

■ Description

FUJI K244 type limit switches have an excellent performance.
K244 limit switches employ a highly dependable and long lasting double break silver alloy contact system.
These can be expected to perform more than 10 million mechanical operations and a rate of 3,000 operations per hour.
The large variety of operating types such as standard stroke, snap-action type, make-before-break type and extended stroke type, etc. allow you to select a suitable limit switch that fully meets your requirements.
K244 limit switches are widely used for industrial machinery such as machine tools, printing machines, conveyors, automatic machines and door interlocking and similar applications.
The aluminum die-cast housing can also be supplied in an oil and water proof version.

■ Technical data

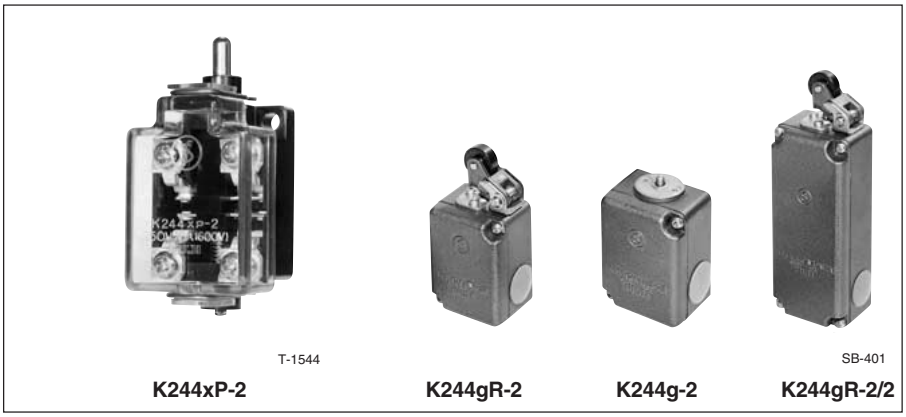
Insulation resistance:
Over 100MΩ at 500V DC
Dielectric strength:
2500V AC rms 1 minute
Max. operating cycle:
3000 cycles per hour
Life expentancy
Mechanical: 10 million operations
Electrical:
- K244-2, 2U and 2V
  3.3 million operations at 24 to 550V AC 3A
- K244-2S
  1.3 million operations at 24 to 550V AC 3A

■ Ordering information

Specify the following:
1. Type number or ordering code

Example

Limit switch	PL
With enclosure	5
Standard contact	N
Cast-metal clad enclosure	G
With top roller lever plunger	R
Contact, normal action 1NO+1NC	22
Ordering code	PL5NGR22



K244xP-2 **K244gR-2** **K244g-2** **K244gR-2/2**

■ Ratings

Type	Thermal current (A)	Making current (A)	Breaking current *1 AC Voltage (V)	AC Current (A)	DC Voltage (V)	Current (A) Resistive	Inductive
K244-2	10	50	24	10	24	10	10
K244-2U			110	10	110	2.2	1.3
K244-2V			220	10	220	0.9	0.4
			440	10	440	0.4	0.2
			550	10	550	0.32*2	0.15*2
K244-2S	10	50	24	10	24	7	7
			110	10	110	1.5	0.9
			220	10	220	0.63	0.28
			440	10	440	0.28	0.14
			550	10	550	0.22*2	0.1*2

Notes: *1 When NO and NC contacts are wired in the same potential.
*2 Value of the breaking current when opposite contacts are not applied with potential.

■ Type number nomenclature

K244 □□ - 2 □

Basic type

Enclosure
xP: With transparent cover
g: Cast-metal clad
go: Cast-metal clad oil-tight
gw: Cast-metal clad water-tight

Actuator
Blank: Top push rod plunger
R: Top roller lever plunger

Contact type
Blank: Standard contact (Normal stroke)
S: Snap action contact
U: Make-before-break contact
V: Extended stroke

Contact arrangement
2: 1NO+1NC
2/2: 2NO+2NC

■ Ordering code

PL 5 N G N – 22

Product category
PL: Limit switch

Enclosure
4: Without enclosure
5: With enclosure

Contact
N: Standard
W: Bifurcated
H: Scrubbing action

Enclosure type
G: Cast-metal clad
L: Cast-metal clad oil-tight
W: Cast-metal clad water-tight

Contact arrangement
22: 1NO+1NC, normal action
21: 1NO+1NC, snap action
23: 1NO+1NC, make-before-break
25: 1NO+1NC, extended stroke
42: 2NO+2NC, normal action
41: 2NO+2NC, snap action
43: 2NO+2NC, make-before-break
45: 2NO+2NC, extended stroke
46: 2NO+2NC, complex

Roller head position
N: Top push rod plunger
R: Top roller lever plunger
W: Reversing, right-hand side roller

■ Actuating slider face angles and approach speeds

Although K244 limit switches have an excellent performance they should not be operated at an extremely high speed or extremely low speeds, since these conditions will cause contact trouble and reduce the mechanical life expectancy of the devices. The slider face angles and approach speeds should be kept within the following recommendations.

● Push rod plunger type

This type of switch obtains the movement from the vertical travel of the rod.

Speed : Max. 1m/sec
Min. 0.015m/sec

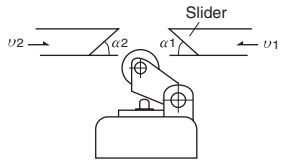
Snap-action types can be used at speeds less than the minimum value.

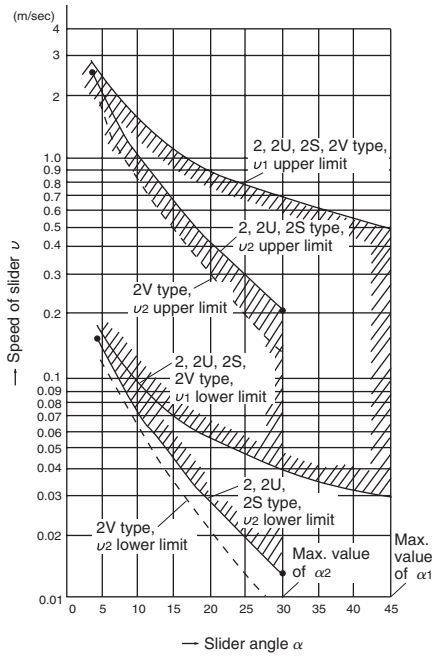
● Roller lever type

The actuating slider face angles and speeds should be within the following range.

The maximum angle of the slider face:
α_1=45° α_2=30°

Snap-action type switches can be used at speeds less than the minimum value.

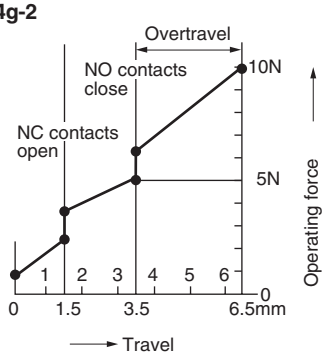



(m/sec)
Speed of slider υ
2, 2U, 2S, 2V type, υ1 upper limit
2, 2U, 2S type, υ2 upper limit
2V type, υ2 upper limit
2, 2U, 2S, 2V type, υ1 lower limit
2, 2U, 2S type, υ2 lower limit
2V type, υ2 lower limit
Max. value of α2
Max. value of α1
Slider angle α

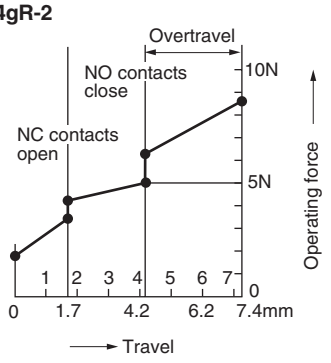
■ Travel operating force curve (Typical example)

The curve indicates forces to operate the contact.

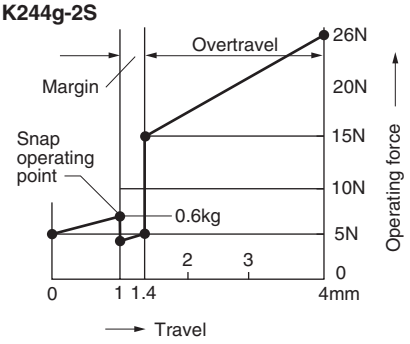
Standard type
K244g-2



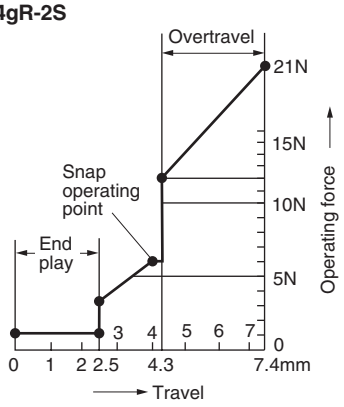
K244gR-2



Snap action contact type
K244g-2S



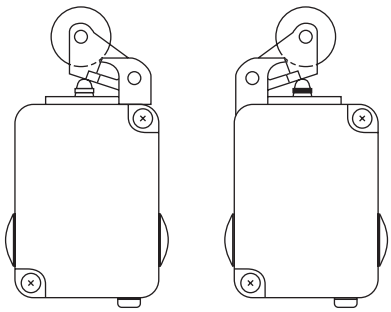
K244gR-2S



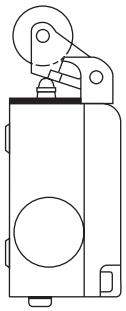
■ Changing direction of operating roller head

Roller head positions can be shifted by 90° in each direction. The head is attached at the standard position when shipped from factory.

Standard **ℓ type**

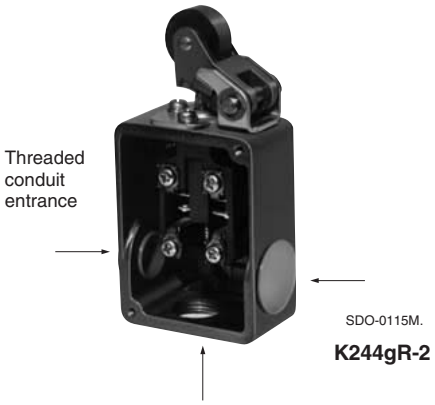


f type



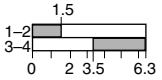
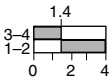
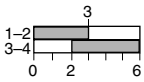
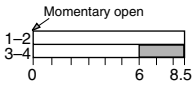
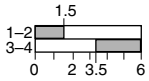
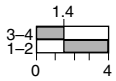
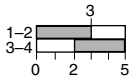
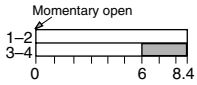
■ Cable connection

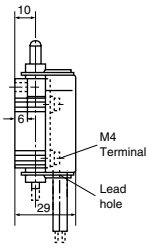
Threaded conduit entrances are provided at 3 locations–left, right and lower side of the limit switch housing. Knockout the plug to carry out wiring. Do not remove plugs from holes not requiring wiring.



K244gR-2

■ K244 series/Standard

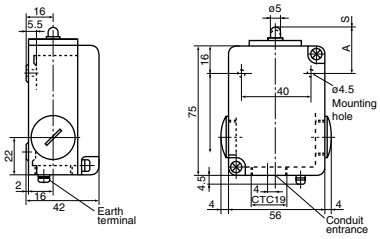
Description	Contact arrangement	Terminal No.	Travel ▨ Contact closed □ Contact open	Type	Ordering code
Top push rod plunger with transparent plastic cover	1NO+1NC		S (mm)		
Normal stroke				**K244xp-2**	PL4NN-22
Snap-action				**K244xp-2S**	PL4NN-21
Make-before-break				**K244xp-2U**	PL4NN-23
SF2025 Extended stroke				**K244xp-2V**	PL4NN-25
Top push rod plunger cast-metal clad	1NO+1NC		S (mm)		
Normal stroke				**K244g-2**	PL5NGN-22
Snap-action				**K244g-2S**	PL5NGN-21
Make-before-break				**K244g-2U**	PL5NGN-23
T-1535 Extended stroke				**K244g-2V**	PL5NGN-25
Top push rod plunger oiltight and watertight cast-metal clad	1NO+1NC		S (mm)		
Snap-action				Oiltight **K244go-2S**	PL5NLN-21
				Watertight **K244gw-2S**	PL5NWN-21
T-1535					



Brass plunger

	-2	-2S	-2U	-2V
A	21	19	21	21
B	1.5	1.5	1.5	1.0
C	6.5	1.4	6	8.5

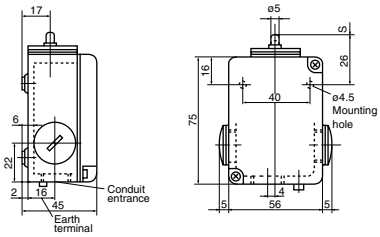
Mass: 60g



Brass plunger

	-2	-2S	-2U	-2V
A	26	24	26	26

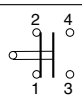
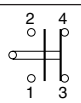
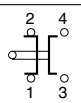
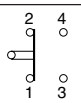
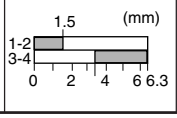
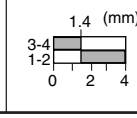
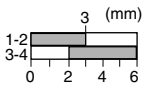
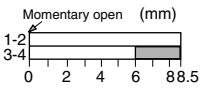
Mass: 200g



Brass plunger

Mass: 210g

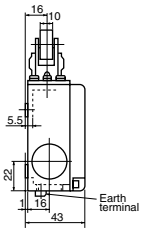
■ Contact action (Typical)

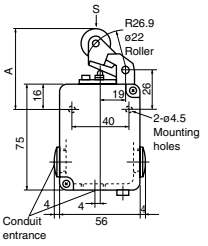
Contact	Standard type (Normal stroke)	Snap action contact	Make-before-break contact	Extended stroke
Contact diagram				
Contact travel ▨: Contact closed □: Contact open				

■ K244 series/Standard

Description	Contact arrangement	Terminal No.	Travel ■ Contact closed □ Contact open	Type	Ordering code
Top roller lever plunger cast-metal clad	1NO+1NC		S (mm)		
Normal stroke	2-1, 4-3	1–2, 3–4	1.7; 0, 4.2, 7.5	**K244gR-2**	PL5NGR-22
Snap-action	2-1, 4-3	3–4, 1–2	4.3; 0, 7.5	**K244gR-2S**	PL5NGR-21
Make-before-break	2-1, 4-3	1–2, 3–4	3.6; 0, 2.4, 7.5	**K244gR-2U**	PL5NGR-23
Extended stroke	2-1, 4-3	1–2, 3–4	0.5; 0, 7.5, 10	**K244gR-2V**	PL5NGR-25

T-1537





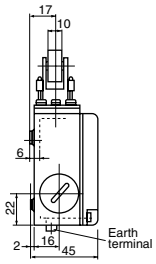
Phenal-formaldehyde roller

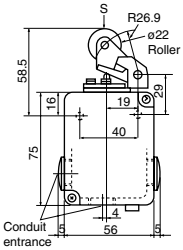
	-2	-2S	-2U	-2V
A	55	55	55	57

Mass: 240g

Description	Contact arrangement	Terminal No.	Travel ■ Contact closed □ Contact open	Type	Ordering code
Top roller lever plunger oiltight and watertight cast-metal clad	1NO+1NC		S (mm)		
Snap-action	2-1, 4-3	3–4, 1–2	6.2; 0, 7.5	Oiltight **K244goR-2S**	PL5NLR-21
				Watertight **K244gwR-2S**	PL5NWR-21

T-1531



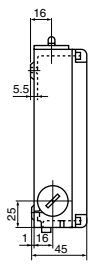


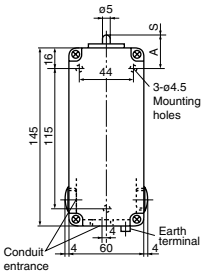
Phenal-formaldehyde roller

Mass: 250g

Description	Contact arrangement	Terminal No.	Travel ■ Contact closed □ Contact open	Type	Ordering code
Top push rod plunger cast-metal clad	2NO+2NC		S (mm)		
Normal stroke	2-1, 4-3	1–2, 3–4	1.5; 0, 3.5, 6	**K244g-2/2**	PL5NGN-42
Snap-action	2-1, 4-3	3–4, 1–2	1.4; 0, 4	**K244g-2S/2S**	PL5NGN-41
Make-before-break	2-1, 4-3	1–2, 3–4	3; 0, 2, 5	**K244g-2U/2U**	PL5NGN-43
Extended stroke	2-1, 4-3	②1–2, 3–4; ①1–2, 3–4	0.5, 6.5; 0, 6, 8.4	**K244g-2V/2V**	PL5NGN-45
Complex (Normal stroke + Make-before-break)	2-1, 4-3	②1–2, 3–4; ①1–2, 3–4	0, 2, 3, 5; 1.5, 3.5	**K244g-2/2U**	PL5NGN-46

T-1567





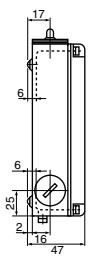
Brass plunger

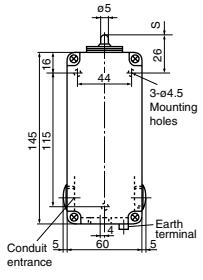
	2/2	2S/2S	2U/2U	2V/2V	2/2U
A	26	24	26	26	26

Mass: 410g

Description	Contact arrangement	Terminal No.	Travel ■ Contact closed □ Contact open	Type	Ordering code
Top push rod plunger oiltight and watertight cast-metal clad	2NO+2NC		S (mm)		
Snap-action	2-1, 4-3	3–4, 1–2	1.4; 0, 2.4	Oiltight **K244go-2S/2S**	PL5NLN-41
				Watertight **K244gw-2S/2S**	PL5NWN-41

T-1567

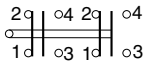
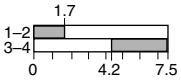
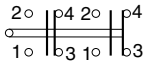
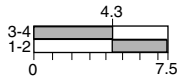
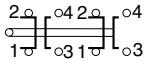
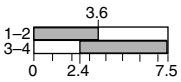
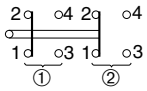
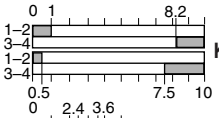
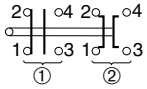
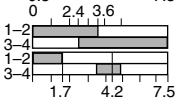




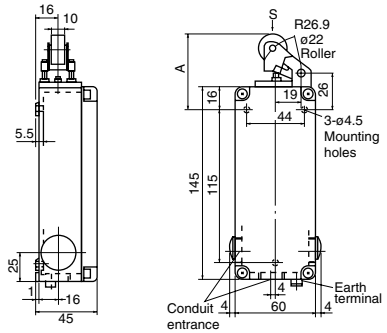
Mass: 420g

Brass plunger

■ K244 series/Standard

Description	Contact arrangement	Terminal No.	Travel ▩ Contact closed □ Contact open	Type	Ordering code
Top roller lever plunger cast-metal clad	2NO+2NC		S (mm)		
Normal stroke				**K244gR-2/2**	PL5NGR-42
Snap-action				**K244gR-2S/2S**	PL5NGR-41
Make-before-break				**K244gR-2U/2U**	PL5NGR-43
Extended stroke				**K244gR-2V/2V**	PL5NGR-45
Complex (Normal stroke + Make-before-break)				**K244gR-2/2U**	PL5NGR-46

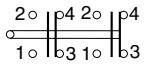
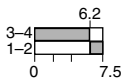
T-1567



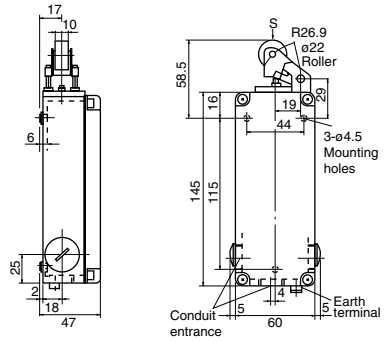
Phenal-formaldehyde roller

	2/2	2S/2S	2U/2U	2V/2V	2/2U
A	55	55	55	57	55

Mass: 440g

Description	Contact arrangement	Terminal No.	Travel ▩ Contact closed □ Contact open	Type	Ordering code
Top roller lever plunger oiltight and watertight cast-metal clad	2NO+2NC		S (mm)		
Snap-action				Oiltight **K244goR-2S/2S**	PL5NLR-41
				Watertight **K244gwR-2S/2S**	PL5NWR-41

T-1567



Phenal-formaldehyde roller

Mass: 450g

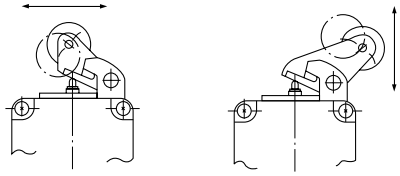
05

Reversing roller lever momentary-contact limit switches, K244g□R

■ Description

These limit switches are designed to detect the movements in the vertical direction. The switch body is identical to the standard type except that one roller is extended from the housing.
The performance is the same as for the standard type.

● **Standard** ● **Reversing**



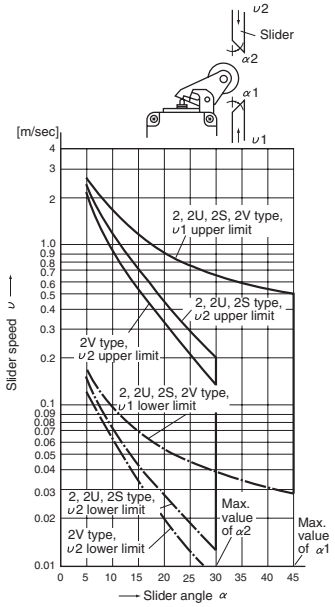
Right side roller

S-2900 SF-2028

K244gRA-2 **K244gRA-2/2**

■ Actuating slider face angles and approach speeds

K244 limit switches have an outstanding performance and will have a long service life under normal conditions. They are designed to carry out 3,000 operations per hour but if they are operated at an extremely high speeds or on the contrary at extremely low speeds contact trouble could develop which would reduce the mechanical life expectancy of the devices.
Reversing roller levers are provided with sliders in their vertical direction. The slider face angles and approach speeds should be kept within the range shown by curves. The maximum angle of the actuating slider is α_1=45°, α_2=30° and under. Snap-action types can be used at speeds less than the minimum value given.



■ Ratings

Type	Thermal current (A)	Making current (A)	Breaking current *1 AC Voltage (V)	AC Current (A)	DC Voltage (V)	Current (A) Resistive	Inductive
K244gRA-2	10	50	24	10	24	10	10
K244gRA-2U			110	10	110	2.2	1.3
K244gRA-2V			220	10	220	0.9	0.4
			440	10	440	0.4	0.2
			550	10	550	0.32	0.15*2
K244gRA-2S	10	50	24	10	24	7	7
			110	10	110	1.5	0.9
			220	10	220	0.63	0.28
			440	10	440	0.28	0.14
			550	10	550	0.22	0.1*2

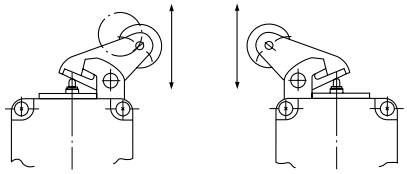
Notes: *1 When NO and NC contacts are wired in the same polarity.
*2 Opposite contacts are not permitted to carry potential.

■ Ordering information

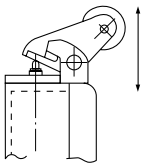
Specify the following
1. Type number or ordering code

Example
Limit switch ..... PL
With enclosure 5
Standard contact ..... N
Cast-metal clad enclosure ..... G
With reversing roller plunger ..... W
Contact 1NO+1NC, snap-action ..... -21
Ordering code PL5NGW-21

■ Changing direction of operating head



Right side roller **Left side roller**



Front-side roller

■ **Ordering code:** *See page 05/113.*
■ **Travel operating force:** *See page 05/114.*
■ **Cable connection:** *See page 05/114.*

■ Type number nomenclature

K244 □□□ - 2 □

Basic type

Enclosure
g: Cast-metal clad
go: Cast-metal clad oil-tight
gw: Cast-metal clad water-tight

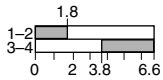
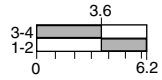
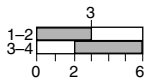
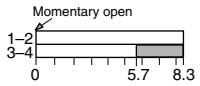
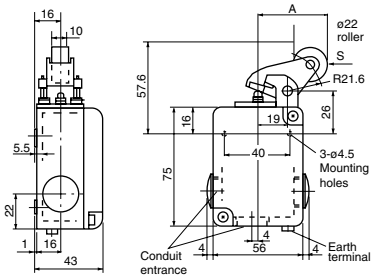
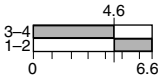
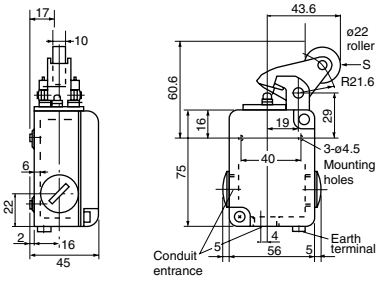
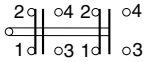
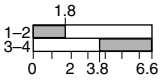
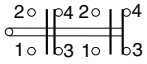
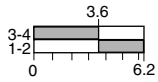
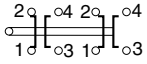
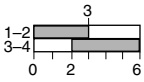
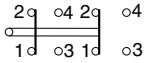
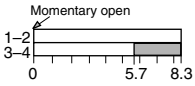
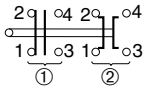
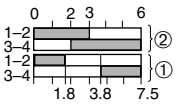
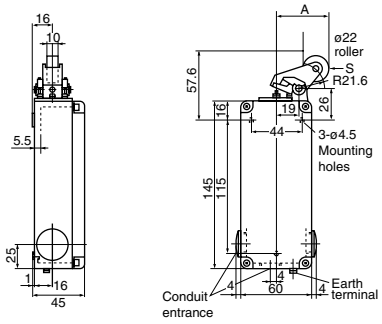
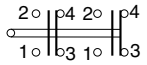
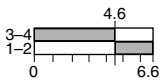
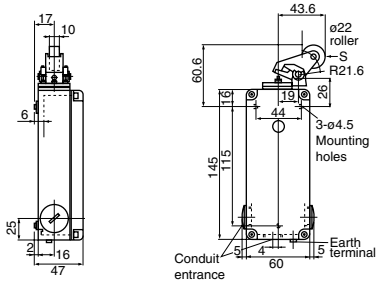
Actuator
R: Top roller lever plunger
A: Reversing roller

Contact type
Blank: Standard contact (Normal stroke)
S: Snap-action contact
U: Make-before-break contact
V: Extended stroke contact

Contact arrangement
2: 1NO+1NC
2/2: 2NO+2NC

■ **Technical data:** Same as standard type, *see page 05/113.*

■ K244 series/Reversing roller

Description	Contact arrangement	Terminal No.	Travel ■ Contact closed □ Contact open	Type	Ordering code	Dimensions, mm
Reversing top roller lever plunger cast-metal clad	1NO+1NC		S (mm)			
Normal stroke				**K244gRA-2**	PL5NGW-22	
Snap-action				**K244gRA-2S**	PL5NGW-21	
Make-before-break				**K244gRA-2U**	PL5NGW-23	
Extended stroke				**K244gRA-2V**	PL5NGW-25	
S-2900						
						-2 -2S -2U -2V A 43.6 43.6 43.6 45.8 Mass: 240g Phenal-formaldehyde roller
Reversing top roller lever plunger oiltight and watertight cast-metal clad	1NO+1NC		S (mm)			
Snap-action				Oiltight **K244goRA-2S**	PL5NLW-21	
				Watertight **K244gwRA-2S**	PL5NWW-21	
S-2900						 Mass: 250g Phenal-formaldehyde roller
Reversing top roller lever plunger cast-metal clad	2NO+2NC		S (mm)			
Normal stroke				**K244gRA-2/2**	PL5NGW-42	
Snap-action				**K244gRA-2S/2S**	PL5NGW-41	
Make-before-break				**K244gRA-2U/2U**	PL5NGW-43	
Extended stroke				**K244gRA-2V/2V**	PL5NGW-45	
Complex (Normal stroke + Make-before-break)				**K244gRA-2/2U**	PL5NGW-46	
SF-2028						 Phenal-formaldehyde roller
						2/2 2S/2S 2U/2U 2V/2V 2/2U A 43.6 43.6 43.6 45.8 43.6 Mass: 440g
Reversing top roller lever plunger oiltight and watertight cast-metal clad	2NO+2NC		S (mm)			
Snap-action				Oiltight **K244goRA-2S/2S**	PL5NLW-41	
				Watertight **K244gwRA-2S/2S**	PL5NWW-41	
SF-2028						 Phenal-formaldehyde roller Mass: 450g

Momentary-contact limit switches for low voltage circuit HK244 and WK244

■ Description

HK244 and WK244 limit switches have been developed for use in low voltage and low current circuits. They will operate effectively in 3 Volts AC or DC, 5mA circuits although they are recommended that they are used in 48 Volts or 110 Volts circuits for best results.

HK244 limit switches

HK244 limit switches are provided with pure silver contacts. The movable contact carries out a scrubbing action during make/break operation ensuring good connections at all times.
The switch body is molded from a high performance resin, and versions with transparent plastic covers and with aluminum die-cast housing are also available.

WK244 limit switches

The bifurcated contact is made of pure silver and like the HK244 series they are also suitable for use with low voltage circuits. The dimensions and operating strokes are similar to the standard type.

■ Ordering information

Specify the following:
1. Type number or ordering code

Example

Limit switch ..... PL
With enclosure 5
Scrubbing contact ..... H
Cast-metal clad enclosure ..... G
Top roller lever plunger ..... R
Contact 1NO+1NC, normal stroke ..... -22
Ordering code PL5HGR-22

■ Dimensions, mm

Same as standard type limit switch K244 series. *See page 05/115 to 05/117, 05/119.*

■ Ordering code: *See page 05/113.*

SK-583
WK244xp-2

T-1537
HK244gR-2

T-1535
HK244g-2

■ Ratings

HK244

Thermal current (A)	Making current (A)	Breaking current *1 AC Voltage (V)	AC Current (A)	DC Voltage (V)	Current (A) Resistive	Inductive
10	50	24	10	24	7	7
		110	10	110	1.5	0.9
		220	10	220	0.63	0.28
		440	10	440	0.28	0.14
		550	10	550	0.22*2	0.1*2

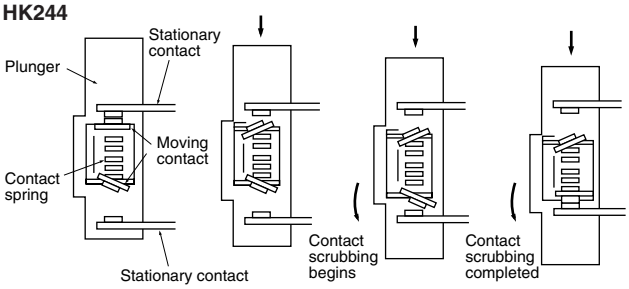
WK244

Thermal current (A)	Making current (A)	Breaking current *1 AC Voltage (V)	AC Current (A)	DC Voltage (V)	Current (A) Resistive	Inductive
10	12.5	110	2.5	110	1.5	0.2
		220	2.5	220	0.63	–

Notes: *1 When NO and NC contacts are wired in same polarity.
*2 Opposite contacts are not permitted to carry potential.

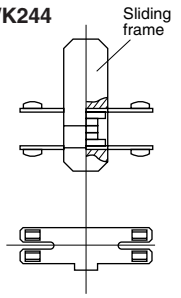
■ Contacts

HK244



Process of scrubbing contact

WK244



Bifurcated contact

■ Technical data

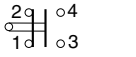
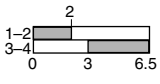
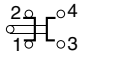
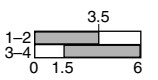
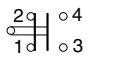
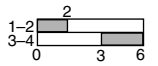
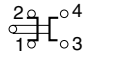
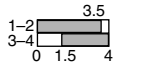
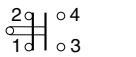
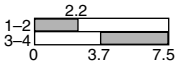
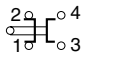
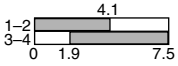
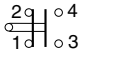
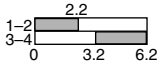
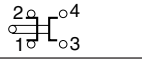
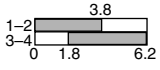
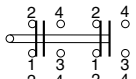
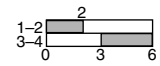
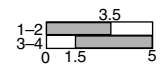
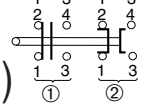
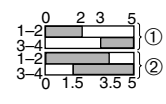
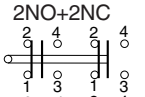
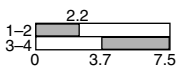
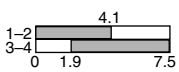
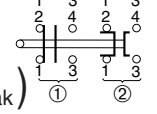
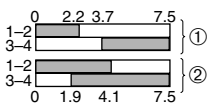
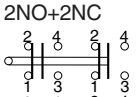
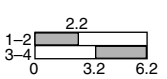
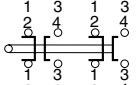
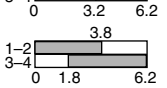
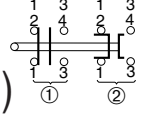
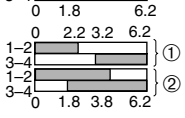
HK244

Insulation resistance: Over 100MΩ at 500VDC
Dielectric strength: 2500V AC rms 1 minute
Max. operating cycle: 3000 cycles per hour
Life expectancy Mechanical: 10 million operations
Electrical: 1.3 million operations at 24 to 550V AC 3A
Allowable ambient temperature: –5° to +60°C

WK244

Insulation resistance: Over 100MΩ at 500VDC
Dielectric strength: 2500VAC rms 1 minute
Max. operating cycle: 3000 cycles per hour
Life expectancy Mechanical: 10 million operations
Electrical: 1 million operations at 220V AC 1.5A
Allowable ambient temperature: –5° to +60°C

■ HK244 and WK244 series

Description	Contact arrangement	Travel (mm) of HK series (WK series: Same as standard series, pages 05/115 to 05/117)	HK series With scrubbing contact action Type	Ordering code	WK series With bifurcated contact Type	Ordering code	Dimensions (Same as K244)
Top push rod plunger transparent plastic cover	1NO+1NC						
Normal stroke			**HK244xp-2**	PL4HGN-22	**WK244xp-2**	PL4WGN-22	*Page 05/115*
Make-before-break			**HK244xp-2U**	PL4HGN-23	**WK244xp-2U**	PL4WGN-23	*Page 05/115*
Top push rod plunger cast-metal clad	1NO+1NC						
Normal stroke			**HK244g-2**	PL5HGN-22	**WK244g-2**	PL5WGN-22	*Page 05/115*
Make-before-break			**HK244g-2U**	PL5HGN-23	**WK244g-2U**	PL5WGN-23	*Page 05/115*
Top roller lever plunger cast-metal clad	1NO+1NC						
Normal stroke			**HK244gR-2**	PL5HGR-22	**WK244gR-2**	PL5WGR-22	*Page 05/116*
Make-before-break			**HK244gR-2U**	PL5HGR-23	**WK244gR-2U**	PL5WGR-23	*Page 05/116*
Reversing top roller lever plunger cast-metal clad	1NO+1NC						
Normal stroke			**HK244gRA-2**	PL5HGW-22	**WK244gRA-2**	PL5WGW-22	*Page 05/119*
Make-before-break			**HK244gRA-2U**	PL5HGW-23	**WK244gRA-2U**	PL5WGW-23	*Page 05/119*
Top push rod plunger cast-metal clad	2NO+2NC						
Normal stroke			**HK244g-2/2**	PL5HGN-41	**WK244g-2/2**	PL5WGN-41	*Page 05/116*
Make-before-break			**HK244g-2U/2U**	PL5HGN-43	**WK244g-2U/2U**	PL5WGN-43	*Page 05/116*
Complex (Normal stroke + Make-before-break)			**HK244g-2/2U**	PL5HGN-46	**WK244g-2/2U**	PL5WGN-46	*Page 05/116*
Top roller lever plunger cast-metal clad	2NO+2NC						
Normal stroke			**HK244gR-2/2**	PL5HGR-41	**WK244gR-2/2**	PL5WGR-41	*Page 05/117*
Make-before-break			**HK244gR-2U/2U**	PL5HGR-43	**WK244gR-2U/2U**	PL5WGR-43	*Page 05/117*
Complex (Normal stroke + Make-before-break)			**HK244gR-2/2U**	PL5HGR-46	**WK244gR-2/2U**	PL5WGR-46	*Page 05/117*
Reversing top roller lever plunger cast-metal clad	2NO+2NC						
Normal stroke			**HK244gRA-2/2**	PL5HGW-41	**WK244gRA-2/2**	PL5WGW-41	*Page 05/119*
Make-before-break			**HK244gRA-2U/2U**	PL5HGW-43	**WK244gRA-2U/2U**	PL5WGW-43	*Page 05/119*
Complex (Normal stroke + Make-before-break)			**HK244gRA-2/2U**	PL5HGW-46	**WK244gRA-2/2U**	PL5WGW-46	*Page 05/119*

Contact closed
Contact open

SP-387

PE-L

KK02-298A

PE1-C, PE2-C

AF89-193

PE1-Y

AF89-458

PE2-CTS

SM-81

PE-U

AF89-744

PE-T

SK586

PE-B7

AF94-163

PE1B2P

AF91-508

PE-X3D

Proximity switches, PE series

■ Description

These proximity switches have many advantages over conventional limit switches, enabling their use where other switches will not do. FUJI offers two types – inductive and magnetic. Sensors and switching components are completely enclosed for protection against oil mist, metal fillng, dust, and moisture.
Inductive types use a solid-state switching device; magnetic types use a reed switch.

PE series proximity switches
Inductive type

Inductive proximity switches are available in AC or DC versions.
The PE-U series is slot type.
The PE1-C and PE1-Y series are cylindrical. The detecting surface of PE-B series is square. The PE-T series switches are slim types. The PE1B2P is compact square type. The PE-L series has analog outputs with the sensor and amplifier separated. The PE2-C series is cylindrical and with stable operating indicator. The PE-X3D is flat type, and PE-4BS2 series is multiple type.
The PE-G4D is space-saving square type.

■ Features

PE-U series *(See page 05/125)*
- Operating distance: 7mm and 10mm
- Operating voltage range: 10 to 30V DC
- Suitable for detecting of ferromagnetic materials

PE1-C and PE1-Y series *(See page 05/126)*
- Short length achieved with IC
- 6 shielded and 4 non-shielded types
- AC 2-wire, DC 2-wire, and DC 3-wire systems
- Stable operating indicator provided as standard (mounting diameter M12 or more, and NO contact type).

PE-B series *(See page 05/130)*
- 4mm to 50mm operating distance
- Types with operating distance exceeding 20mm conform to the CENELEC Standard.
- Operating voltage range: 80 to 250V AC or 10 to 30V DC

PE-X15D series *(See page 05/133)*
- Square-flat type
- DC supply/3-wire, 12/24V DC
- Operating distance: 15mm

PE-T series *(See page 05/134)*
- Unique “Magnetic Shield Method” permits side-by-side mounting
- Only 12mm thick – achieved with IC
- Built-in reverse polarity and surge voltage protection

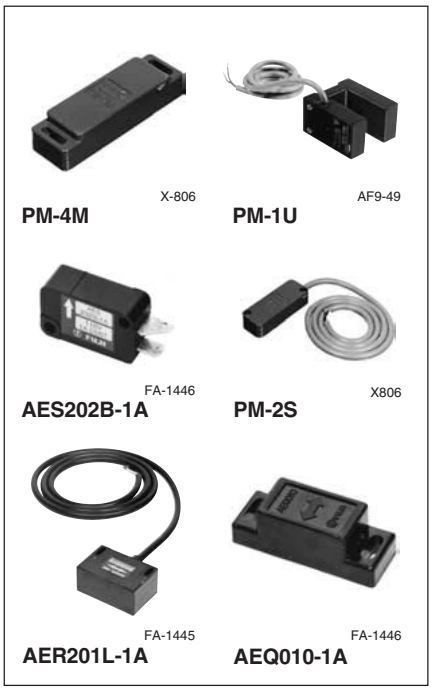
PE1B2P series *(See page 05/136)*
- Operating distance: 2.5mm
- DC supply/3-wire, 12/24V DC

PE-L series *(See page 05/138)*
- Output voltage proportional to distance
- Linearity: ±1.5% of full scale
  Resolution: ±0.05% of full scale
- Operating frequency: Up to 10kHz
- Operating distance: 2 to 10mm

PE2-C series *(See page 05/142)*
- 4 shielded and 3 non-shielded types
- Stable operating level indicating lamp facilitates adjustment
- DC 2-wire, DC 3-wire and AC/DC 2-wire operating systems
- 40 to 250V AC/20 to 250V DC (AC/DC 2-wire system)

PE-X3D series *(See page 05/146)*
- Only 7mm thick
- Operating voltage range: 10 to 30V DC

PE-G4D *(See page 05/147)*
- Requires about half the mounting space of PE-B4 type.



AES, AER and PM type proximity switches (Magnetically-operated reed switches)
In the standard type PM the reed switch element and the sensing magnet are separate elements. The AES type is also a separate type but is a miniaturized version. In the AER type the sensing magnet element and the reed switch are integrated in one housing.

■ Features

- Since these proximity switches make use of a permanent magnet no external power source is required to operate the reed switch.
- The dry reed contact switch is dependable in operation and has an extended service life.
- The unit strongly resists vibration and is both water-and dust-tight (except for AES type).
- Either an AC or DC power source can be used for the reed switch output.
- Compact in design and easy to install anywhere.
- Can be mounted on a steel frame (In this case the effective operating distance is reduced by one-half).

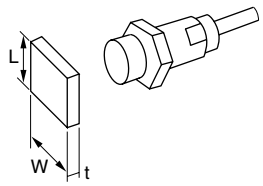
■ For further information

See pages 05/148, 149, 151, 152.

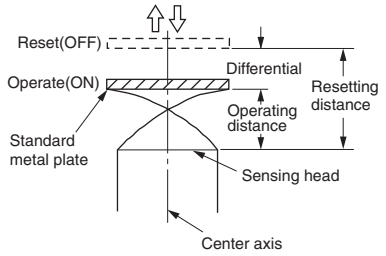
Inductive type

■ Description

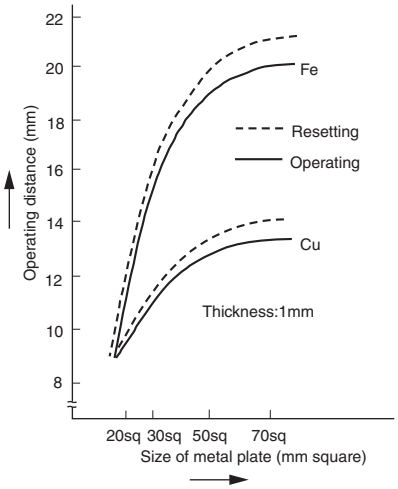
● Standard metal plate (object)
Standard metal plate (object) is a standard sensing target to measure the basic performance. Its shape, size, and material are stipulated. Iron is usually used as material.



● Operating distance
The operating distance is the distance along the center axis of the head from the sensing head to the point where a metal plate traveling along the path actuates the switch.
Normally the operating distance means this distance in vertical direction.

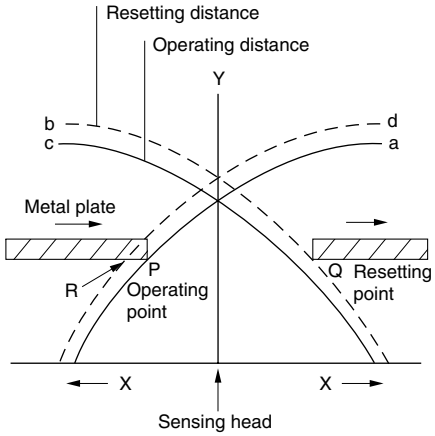


The following curves indicate typical operating distances. Values for aluminum or copper will be less than 1/2 those indicated for iron. In order for an object to be detected, its dimensions must be no smaller than 30 × 30mm, or no larger than 70 × 70mm. Objects smaller or larger will not be detected, regardless of material.



● Differential distance
This is the distance between the actuating point where the switch is actuated and the reset point where the switch resets after the metal plate is withdrawn from the sensing head.

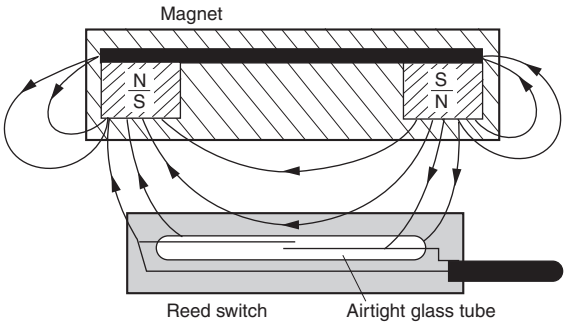
● Response curve
This curve shows the detect-to-reset range with object distance from the head. The switch operates when the object approaching form the left reaches point P on curve ‘a’, and resets when the trailing edge of the object reaches point Q on curve ‘b’.
The switch also resets when the object is withdrawn from point P to R on curve ‘d’.



Magnetically operated type

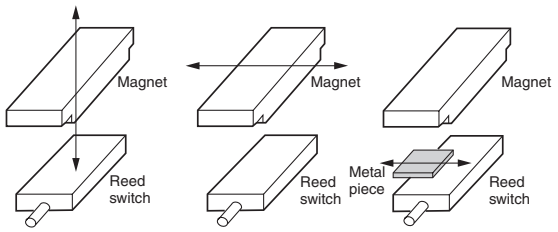
■ Operating
These switches comprise a sensor and a reed switch element, which closes when a magnetic object approaches.

■ Reed switch
The constructions of the reed switch and its magnetic element are shown in the diagram. The reed switch is made up of two magnetic reeds in an airtight glass tube. The 2 reeds are magnetized when they come within the magnetic field of the magnetic element. In this case the tips of these 2 reeds have positive and negative charges respectively and are attracted to each other. When the magnetic field is removed the magnetic charge is lost and the reed switch opens.
FUJI's reed switches are designed to operate in the same manner as the snap-action of conventional limit switches.



■ Mode of operation
The operation methods of the magnetic type proximity switches are as illustrated.

Separation type

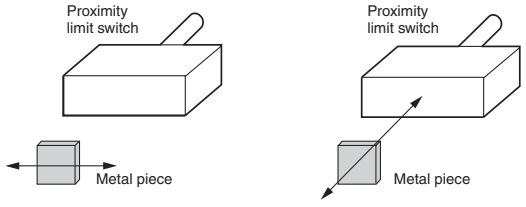


Reed switch is fixed but magnet moves in a vertical direction.

Reed switch is fixed but magnet moves in a horizontal direction.

Both the reed switch and magnet are fixed. And metal object passes between these two.

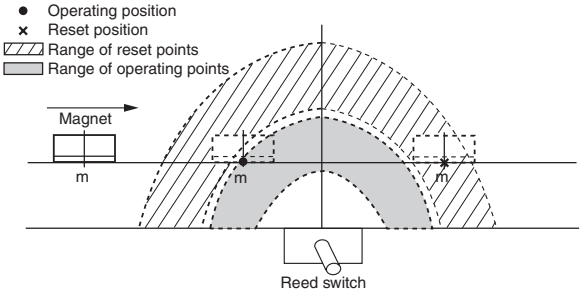
Integrated type



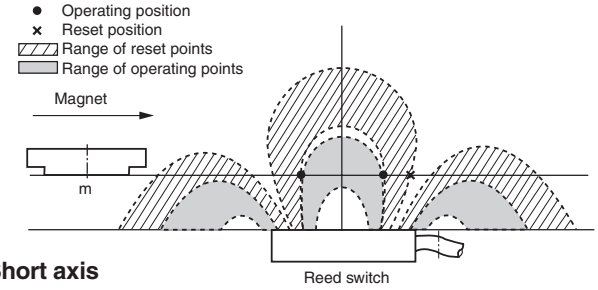
Proximity switch is fixed and the metal object moves in a horizontal direction.

Proximity switch is fixed and the metal piece moves forwards and backwards.

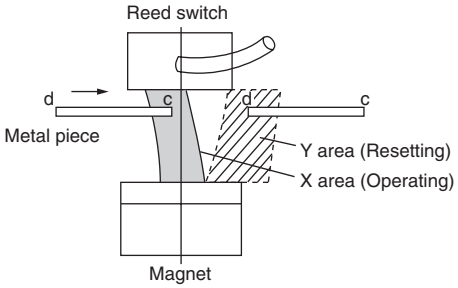
■ Operating characteristics
Short axis
Magnet: Travel
Reed switch: Fixed
The reed switch closes when 'm' the magnet center reaches '●' position. It resets at 'x' position.



Long axis
Magnet: Travel
Reed switch: Fixed
This method is feasible but if the distance between the magnet and the reed switch is not correct the reed switch may switch 3 times when the magnet carries out only 1 travel.
Try to avoid using this arrangement.



Short axis
Magnet: Fixed
Reed switch: Fixed
(In this case the reed switch operates as an NC contact.)
Reed switch closes when the metal piece is out of 'X' region between the magnet and the reed switch.
When the metal piece passes through the 'X' region the reed switch will open. Thus the reed switch opens as soon as 'c' the tip of the metal piece reaches 'X' region and closes as soon as 'd' the end leaves 'Y' region.

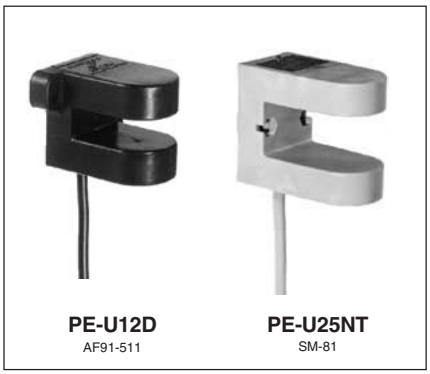


Inductive proximity switches–Slot type, PE-U

Supply voltage: 12/24V DC
Output: Transistor 50, 100mA max.
Operating distance: 7, 10mm

■ Features

- The slot type detecting surfaces of 12 and 25mm are available. Stable detection characteristics can be obtained when a metal plate passes through the slot ON or OFF-center.
- Best suited for detection of magnetic metal plates passing through the slot.
- Provided with built-in reverse polarity and surge voltage protection circuits.
- LED indicator lamps are provided, thus facilitating operational checks.
- Degree of protection meets the requirement of IP67 (IEC), thus permitting operation in unfavorable environments.
- NPN transistor voltage/current outputs are provided, thus permitting a wide range of applications.

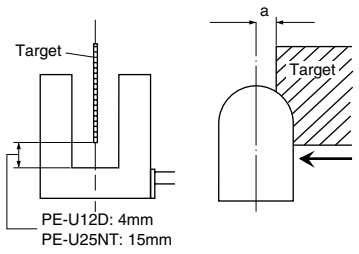


PE-U12D AF91-511 **PE-U25NT** SM-81

■ Specifications

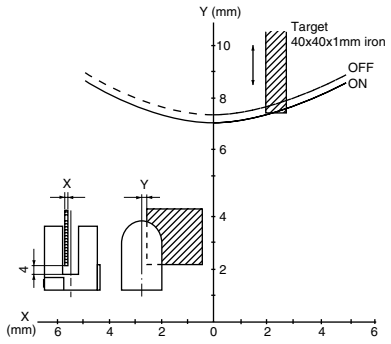
Type (Ordering code)	**PE-U25NT** (PE1U25-ND)	**PE-U12D** (PE1U12-D)
Operating distance	10mm ± 2*	7mm ± 1*
Standard target size (iron)	50 × 50 × 2.3mm	40 × 40 × 1mm
Supply voltage	12/24V DC	
Operating voltage range	10 to 30V DC	
Power consumption	Max. 20mA at 24V DC	Max. 15mA at 24V DC
Output capacity	Max. 100mA	Max. 50mA
Response time or frequency	Max. 3ms. (ON time)	Min. 50Hz
Differential	0.3 to 2mm	Max. 15% of operating distance
Ambient temperature	–25 to +70°C	
Degree of protection	IP67 (IEC)	
Insulation resistance	Over 50MΩ at 500V DC	
Dielectric strength	2000V AC rms. 1minute	1000V AC rms. 1minute
Mass	210g	120g

Note: * This indicates the distance "a" shown in figure at right.

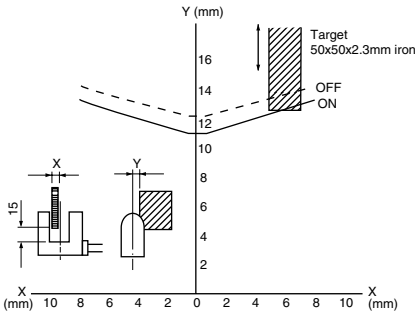


■ Response curve

PE-U12D

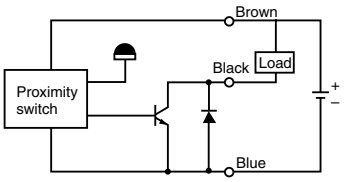


PE-U25NT



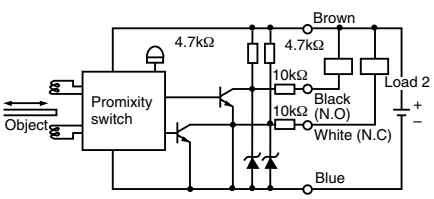
■ Wiring diagrams

PE-U12D



NPN transistor current output, 1NO

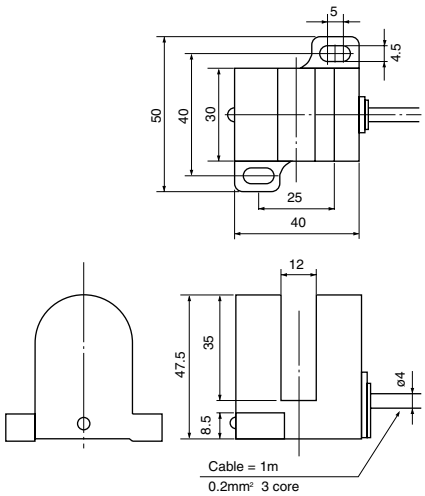
PE-U25NT



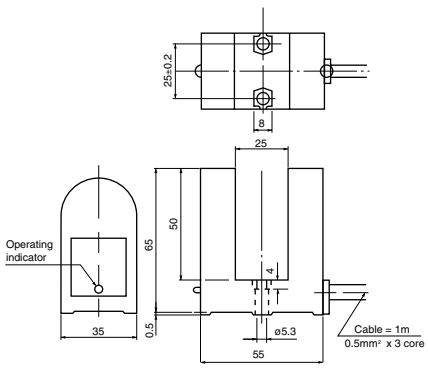
NPN transistor voltage/current output, SPDT

■ Dimensions, mm

PE-U12D



PE-U25NT



■ Ordering information

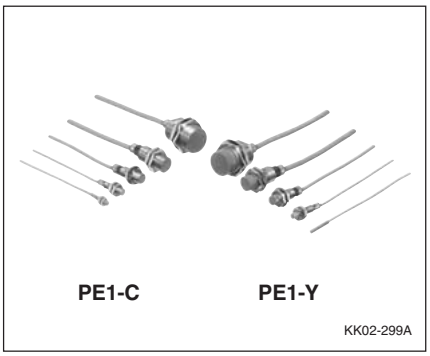
Specify the following:
1. Type number or ordering code

Inductive proximity switches– Cylindrical type, PE1-C, PE1-Y

Operating system
DC supply/3-wire and 2-wire system
AC supply/2-wire system
Operating distance: 0.8 to 20mm
This proximity switch has a cylindrical shape. The sensor is fitted to an end of the cylinder and the body is provided with a built-in control circuit.
This type conforms to the requirements of the CENELEC (Europe) Standards and as the dimensions, ratings and performance comply with the requirements of these Standards, this type can be used as replacement units.

■ Features

- Short length because of the use of IC circuit.
- Shielded and non-shielded type are available.
- Red and green LED is provided for a stable operating indication and easy setting, mounting diameter M12 or more and NO contact type only.
- Provided with reverse polarity and surge voltage protection circuits.
- Degree of protection: IEC IP67



■ Type number nomenclature

PE 1-C S 10 D B

Basic type

Series
C: Cylindrical, screwed
Y: Cylindrical, straight

Shield
Blank: Non-shielded
S: Shielded

Operating distance
0.8 : 0.8mm 2 : 2mm 10 : 10mm
1 : 1mm 5 : 5mm

Contact
Blank: 1NO
B: 1NC

Operating system
D: DC, 3-wire, NPN
Q: DC, 3-wire, PNP
S: DC, 2-wire
A: AC, 2-wire

■ Ordering code

PE1 S 10-D B

Basic type

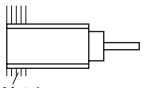
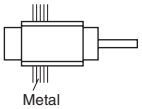
Series
Y: Cylindrical, straight
C: Cylindrical, non-shielded
S: Cylindrical, shielded

Operating distance
P8: 0.8mm 05: 5.0mm
1P: 1.5mm 10: 10.0mm
02: 2.0mm 20: 20.0mm

Contact
Blank: 1NO
B: 1NC

Operating system
D: DC, 3-wire, NPN
Q: DC, 3-wire, PNP
S: DC, 2-wire
A: AC, 2-wire

■ Specifications

Description	Operating system	Operating distance (mm)	Mounting diameter	Supply voltage (Operating voltage range)	1NO Type	Ordering code	1NC Type	Ordering code
Shielded  Metal	DC supply 3-wire, NPN transistor output	0.8	4mm-dia.	12/24V DC (10 to 30V DC)	**PE1-YS08D**	PE1YP8-D	**PE1-YS08DB**	PE1YP8-DB
		0.8	M5		**PE1-CS08D**	PE1SP8-D	**PE1-CS08DB**	PE1SP8-DB
		1.5	M8		**PE1-CS1R5D**	PE1S1P-D	**PE1-CS1R5DB**	PE1S1P-DB
		2	M12		**PE1-CS2D**	PE1S02-D	**PE1-CS2DB**	PE1S02-DB
		5	M18		**PE1-CS5D**	PE1S05-D	**PE1-CS5DB**	PE1S05-DB
		10	M30		**PE1-CS10D**	PE1S10-D	**PE1-CS10DB**	PE1S10-DB
	DC supply 3-wire, PNP transistor output	0.8	4mm-dia.	12/24V DC (10 to 30V DC)	**PE1-YS08Q**	PE1YP8-Q	**PE1-YS08QB**	PE1YP8-QB
		0.8	M5		**PE1-CS08Q**	PE1SP8-Q	**PE1-CS08QB**	PE1SP8-QB
		1.5	M8		**PE1-CS1R5Q**	PE1S1P-Q	**PE1-CS1R5QB**	PE1S1P-QB
		2	M12		**PE1-CS2Q**	PE1S02-Q	**PE1-CS2QB**	PE1S02-QB
		5	M18		**PE1-CS5Q**	PE1S05-Q	**PE1-CS5QB**	PE1S05-QB
		10	M30		**PE1-CS10Q**	PE1S10-Q	**PE1-CS10QB**	PE1S10-QB
	DC supply 2-wire	2	M12	12/24V DC (10 to 30V DC)	**PE1-CS2S**	PE1S02-S	**PE1-CS2SB**	PE1S02-SB
		5	M18		**PE1-CS5S**	PE1S05-S	**PE1-CS5SB**	PE1S05-SB
		10	M30		**PE1-CS10S**	PE1S10-S	**PE1-CS10SB**	PE1S10-SB
	AC supply 2-wire	2	M12	120/240V AC (45 to 260V AC)	**PE1-CS2A**	PE1S02-A	**PE1-CS2AB**	PE1S02-AB
		5	M18		**PE1-CS5A**	PE1S05-A	**PE1-CS5AB**	PE1S05-AB
		10	M30		**PE1-CS10A**	PE1S10-A	**PE1-CS10AB**	PE1S10-AB
Non-shielded  Metal	DC supply 3-wire, NPN transistor output	2	M8	12/24V DC (10 to 30V DC)	**PE1-C2D**	PE1C02-D	**PE1-C2DB**	PE1C02-DB
		5	M12		**PE1-C5D**	PE1C05-D	**PE1-C5DB**	PE1C05-DB
		10	M18		**PE1-C10D**	PE1C10-D	**PE1-C10DB**	PE1C10-DB
		20	M30		**PE1-C20D**	PE1C20-D	**PE1-C20DB**	PE1C20-DB
	DC supply 3-wire, PNP transistor output	2	M8		**PE1-C2Q**	PE1C02-Q	**PE1-C2QB**	PE1C02-QB
		5	M12		**PE1-C5Q**	PE1C05-Q	**PE1-C5QB**	PE1C05-QB
		10	M18		**PE1-C10Q**	PE1C10-Q	**PE1-C10QB**	PE1C10-QB
		20	M30		**PE1-C20Q**	PE1C20-Q	**PE1-C20QB**	PE1C20-QB
	DC supply 2-wire	5	M12	12/24V DC (10 to 30V DC)	**PE1-C5S**	PE1C05-S	**PE1-C5SB**	PE1C05-SB
		10	M18		**PE1-C10S**	PE1C10-S	**PE1-C10SB**	PE1C10-SB
		20	M30		**PE1-C20S**	PE1C20-S	**PE1-C20SB**	PE1C20-SB
	AC supply 2-wire	5	M12	120/240V AC (45 to 260V AC)	**PE1-C5A**	PE1C05-A	**PE1-C5AB**	PE1C05-AB
		10	M18		**PE1-C10A**	PE1C10-A	**PE1-C10AB**	PE1C10-AB
		20	M30		**PE1-C20A**	PE1C20-A	**PE1-C20AB**	PE1C20-AB

■ Specifications

Type	PE1-YS08D, DB PE1-CS08D, DB	PE1-YS08Q, QB PE1-CS08Q, QB	PE1-CS□D, DB PE1-C□D, DB	PE-CS□Q, QB PE1-C□Q, QB	PE1-CS□S, SB PE1-C□S, SB	PE1-CS□A, AB PE1-C□A, AB
Output	NPN transistor, open collector output	PNP transistor, open collector output	NPN transistor, open collector output	PNP transistor, open collector output	Transistor output	Thyristor output
Current consumption	10mA or less at 24V DC		15mA or less at 24V DC		–	–
Leakage current	–		–		0.8mA or less at 24V DC	1.5mA or less at 200V AC
Ambient temperature	–25 to 70°C		–25 to 80°C		–25 to 80°C	–25 to 80°C
Dielectric strength	250V AC 1 min.		1000V AC 1min.		1000V AC 1 min.	2000V AC 1 min.
Insulation resistance	50MΩ or more at 250V DC megger		50MΩ or more at 500V DC megger			
Degree of protection	IP67 (IEC Standard)					
Vibration	10-55Hz, 1.5mm double amplitude (in X, Y, Z directions, respectively for 2 hours)					
Shock	500m/s^2		–			
Protection circuit	Reverse polarity and surge voltage		Reverse polarity, short-circuit and surge voltage			Surge voltage

■ Response frequency

Type	Frequency (Hz)
PE1-CS1R5D, 5DB, 5Q, 5QB	2000
PE1-CS2D, 2DB, 2Q, 2QB	1500
PE1-YS08D, 08DB, 08Q, 08QB PE1-CS08D, 08DB, 08Q, 08QB PE1-CS2S, 2SB	1000
PE1-C2D, 2DB, 2Q, 2QB PE1-C5S, 5SB	800
PE1-CS5D, 5DB, 5Q, 5QB	600
PE1-CS5S, 5SB	500
PE1-CS10D, 10DB, 10Q, 10QB, 10S, 10SB PE1-C5D, 5DB, 5Q, 5QB, 10S, 10SB	400
PE1-C10D, 10DB, 10Q, 10QB	200
PE1-C20D, 20DB, 20Q, 20QB	100
PE1-CS2A, 2AB, 5A, 5AB, 10A, 10AB PE1-C5A, 5AB, 10A, 10AB, 20A, 20AB	25

■ Output capacity

Type	Output
PE1-YS08D, 08DB, 08Q, 08QB PE1-CS08D, 08DB, 08Q, 08QB	Current output*1 100mA max.
PE1-CS1R5D, 5DB, 5Q, 5QB PE1-CS2D, 2DB, 2Q, 2QB PE1-CS5D, 5DB, 5Q, 5QB PE1-CS10D, 10DB, 10Q, 10QB PE1-C2D, 2DB, 2Q, 2QB PE1-C5D, 5DB, 5Q, 5QB PE1-C10D, 10DB, 10Q, 10QB PE1-C20D, 20DB, 20Q, 20QB	Current output*1 200mA max.
PE1-CS2S, 2SB, 5S, 5SB, 10S, 10SB PE1-C5S, 5SB, 10S, 10SB, 20S, 20SB	Current output 3 to 200mA
PE1-CS2A, 2AB, 5A, 5AB, 10A, 10AB PE1-C5A, 5AB, 10A, 10AB, 20A, 20AB	Current output*2 5 to 200mA

*1 Transistor, open collector output
*2 Refer to output capacity derating curve, *see page 05/128*

■ Accessories (optional)

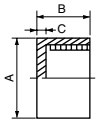
● Mounting brackets

Type	Ordering code	Dimensions, mm A	B	C	D	Screw (supplied)	Used with
PX1-P4	PE1Z0036	13	7.5	6	20	M3 × 10	PE1-YS08
PX1-P8	PE1Z0037	18	10	18	28	M4 × 20	PE1-CS1R5 PE1-C2
PX1-P12	PE1Z0033	24	12.5	20	37	M4 × 25	PE1-CS2 PE1-C5
PX1-P18	PE1Z0034	32	17	30	47	M5 × 32	PE1-CS5 PE1-C10
PX1-P30	PE1Z0035	45	17	50	60	M5 × 50	PE1-CS10 PE1-C20

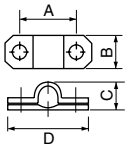
● Surface protection covers

Type	Ordering code	Dimensions, mm A	B	C	Used with
PX1-C12S	PE1Z0030	ø15	5	0.6	PE1-CS2
PX1-C18S	PE1Z0031	ø22.5	8	1.1	PE1-CS5
PX1-C30S	PE1Z0032	ø35	12	1.6	PE1-CS10

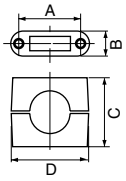
KK02-301A



PX1-P4

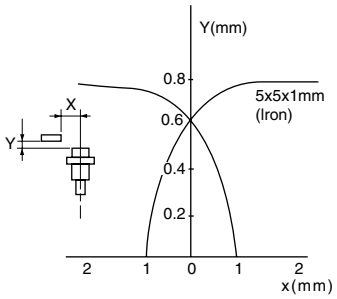


PX1-P8 to P30

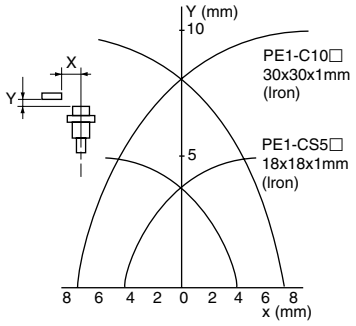


■ Response curve for iron (Typical)

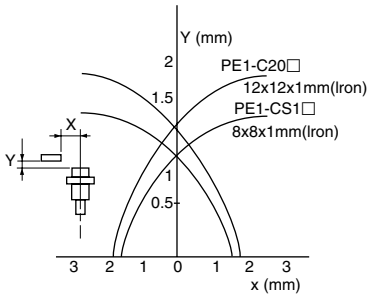
PE1-YS08
PE1-CS08



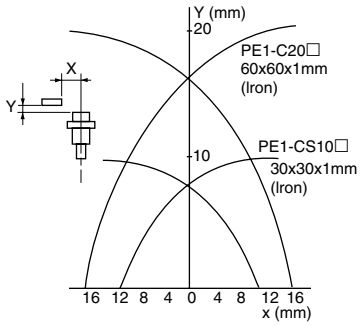
PE1-CS5□
PE1-C10□



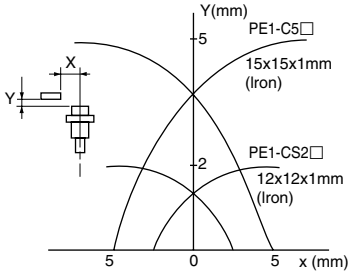
PE1-CS1R5
PE1-C2□



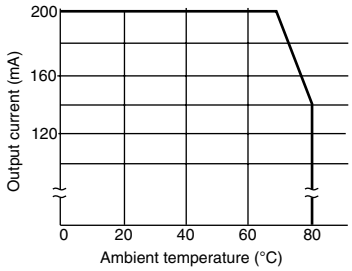
PE1-CS10□
PE1-C20□



PE1-CS2□
PE1-C5□

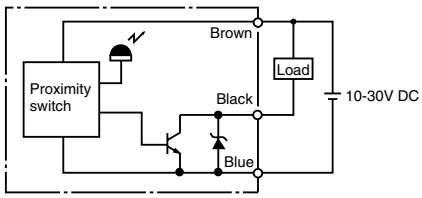


Output capacity derating
PE1-C□A

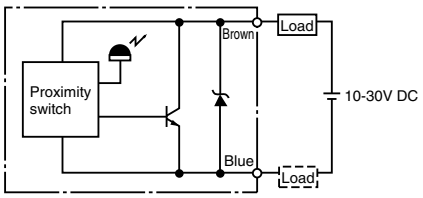


■ Wiring diagrams

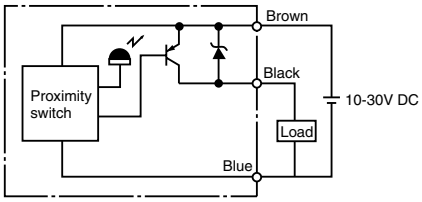
● DC supply/3-wire system, NPN transistor output



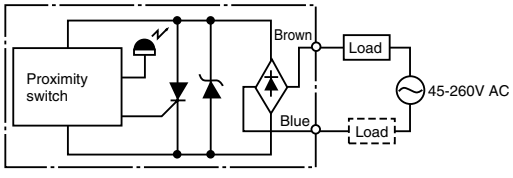
● DC supply/2-wire system
PE1-C□S (1NO, 1NC)



● DC supply/3-wire system, PNP transistor output

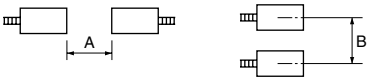


● AC supply/2-wire system
PE1-C□A (1NO, 1NC)



■ Mutual interference

Be sure to space two switches at a distance greater than that shown in the table at right to prevent mutual interference.



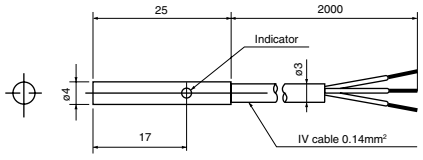
Type	A (mm)	B (mm)
PE1-YS08□	10	5
PE1-CS08□	10	5
PE1-CS1R5□	20	15
PE1-CS2□	30 (15)	20 (12)
PE1-CS5□	50 (25)	30 (18)
PE1-CS10□	100 (50)	70 (35)
PE1-C2□	30	30
PE1-C5□	80 (40)	80 (40)
PE1-C10□	200 (100)	120 (60)
PE1-C20□	300 (150)	200 (100)

Note: The values in parentheses are applicable when using two switches with oscillation frequencies different from each other.

■ Dimensions, mm

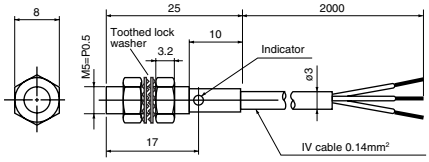
● Shielded

PE1-YS08□



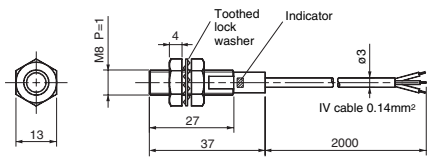
Mass: 30g

PE1-CS08□



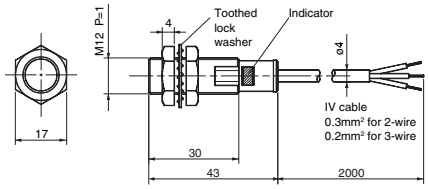
Mass: 30g

PE1-CS1R5□



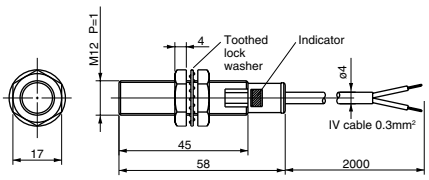
Mass: 40g

PE1-CS2□



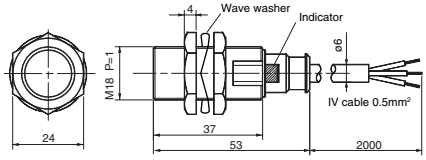
Mass: 70g

PE1-CS2A



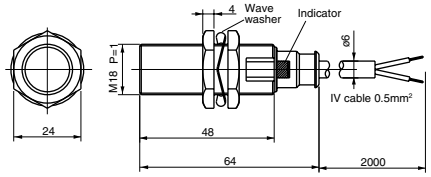
Mass: 100g

PE1-CS5□



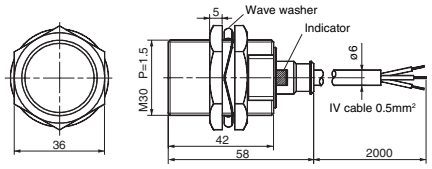
Mass: 160g

PE1-CS5A



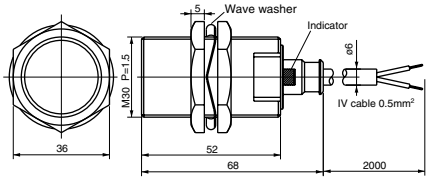
Mass: 170g

PE1-CS10□



Mass: 280g

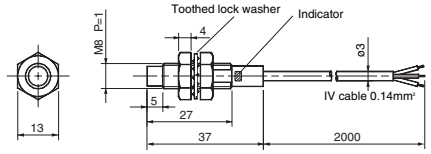
PE1-CS10A



Mass: 340g

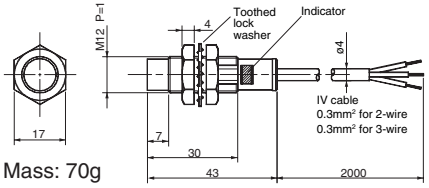
● Non-shielded

PE1-C2□



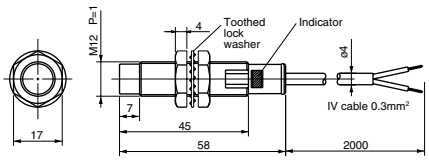
Mass: 40g

PE1-C5□



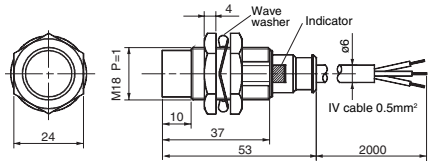
Mass: 70g

PE1-C5A



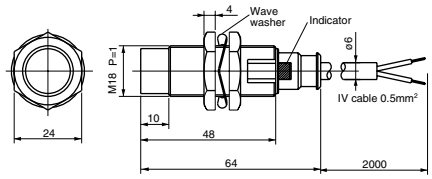
Mass: 100g

PE1-C10□



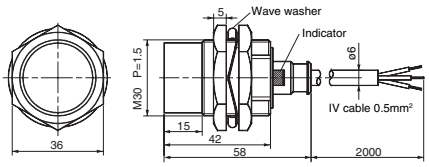
Mass: 160g

PE1-C10A



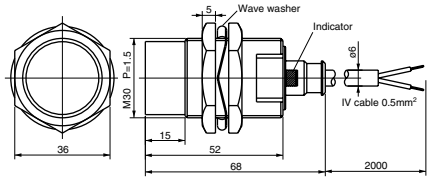
Mass: 170g

PE1-C20□



Mass: 280g

PE1-C20A



Mass: 340g

Inductive proximity switches–Square type, PE-B

Supply voltage:
10-30V DC
80-250V AC, 50/60Hz
Operating distance: 4 to 50mm

■ Features

- Operating distance from 4mm to 50mm permits a variety of applications.
- LED's for operating indication lamp are provided for all types thus facilitating operation checks.
- Ones with an operating distance of over 20mm meet the requirements of the CENELEC Standards.
- Wide operating voltage range
  Operating range of supply voltage is from 80 to 250V AC or from 10 to 30V DC.
- Provided with built-in reverse polarity and surge voltage protection circuits.
- PNP output types are also available thus permitting application to machine tools in Europe.

PE-B SK-588

■ Type number nomenclature

PE – B 4 D 3 B

Basic type

Series
B: Square shaped

Operating distance
4: 4mm 20: 20mm
7: 7mm 30: 30mm
10:10mm 50: 50mm
15:15mm

Operating system
D: DC, 3-wire, NPN output
Q: DC, 3-wire, PNP output
A: AC, 2-wire
S: DC, 2-wire

Sensing head direction
Blank: Standard
3: Upper side (PE–B4 only)

Contact
Blank: 1NO
B: 1NC

■ Ordering code

PE1 B 10 – D B 3

Basic type

Series
B: Square shaped

Operating distance
04: 4mm 20: 20mm
07: 7mm 30: 30mm
10: 10mm 50: 50mm
15: 15mm

Operating system
D: DC, 3-wire, NPN output
Q: DC, 3-wire, PNP output
A: AC, 2-wire
S: DC, 3-wire

Contact
Blank: 1NO
B: 1NC

Sensing head direction
Blank: Standard
3: Upper side (PE-B4 only)

■ Versions

Operating system	Target size (mm)	Operating distance (mm)	Output * 1NO Type	Ordering code	1NC Type	Ordering code	Output * 1NO Type	Ordering code	1NC Type	Ordering code
DC supply 3-wire	20 × 20 × 1	4	**PE-B4D**	PE1B04-D	**PE-B4DB**	PE1B04-DB	**PE-B4Q**	PE1B04-Q	**PE-B4QB**	PE1B04-QB
	20 × 20 × 1	4	**PE-B4D3**	PE1B04-D3	**PE-B4D3B**	PE1B04-DB3	**PE-B4Q3**	PE1B04-Q3	**PE-B4Q3B**	PE1B04-QB3
	30 × 30 × 1	7	**PE-B7D**	PE1B07-D	**PE-B7DB**	PE1B07-DB	**PE-B7Q**	PE1B07-Q	**PE-B7QB**	PE1B07-QB
	40 × 40 × 1	10	**PE-B10D**	PE1B10-D	**PE-B10DB**	PE1B10-DB	**PE-B10Q**	PE1B10-Q	**PE-B10QB**	PE1B10-QB
	50 × 50 × 1	15	**PE-B15D**	PE1B15-D	**PE-B15DB**	PE1B15-DB	–	–	–	–
	50 × 50 × 1	20	**PE-B20D**	PE1B20-D	**PE-B20DB**	PE1B20-DB	**PE-B20Q**	PE1B20-Q	**PE-B20QB**	PE1B20-QB
	90 × 90 × 1	30	**PE-B30D**	PE1B30-D	**PE-B30DB**	PE1B30-DB	**PE-B30Q**	PE1B30-Q	**PE-B30QB**	PE1B30-QB
	150 × 150 × 1	50	**PE-B50D**	PE1B50-D	**PE-B50DB**	PE1B50-DB	**PE-B50Q**	PE1B50-Q	**PE-B50QB**	PE1B50-QB
AC supply 2-wire	30 × 30 × 1	7	**PE-B7A**	PE1B07-A	–	–	–	–	–	–
	40 × 40 × 1	10	**PE-B10A**	PE1B10-A	–	–	–	–	–	–
	50 × 50 × 1	20	**PE-B20A**	PE1B20-A	–	–	–	–	–	–
	90 × 90 × 1	30	**PE-B30A**	PE1B30-A	**PE-B30AB**	PE1B30-AB	–	–	–	–
	150 × 150 × 1	50	**PE-B50A**	PE1B50-A	**PE-B50AB**	PE1B50-AB	–	–	–	–
DC supply 2-wire	20 × 20 × 1	4	**PE-B4S**	PE1B04-S	**PE-B4SB**	PE1B04-SB	–	–	–	–
	30 × 30 × 1	7	**PE-B7S**	PE1B07-S	**PE-B7SB**	PE1B07-SB	–	–	–	–
	40 × 40 × 1	10	**PE-B10S**	PE1B10-S	**PE-B10SB**	PE1B10-SB	–	–	–	–
	50 × 50 × 1	20	**PE-B20S**	PE1B20-S	**PE-B20SB**	PE1B20-SB	–	–	–	–
	90 × 90 × 1	30	**PE-B30S**	PE1B30-S	**PE-B30SB**	PE1B30-SB	–	–	–	–
	150 × 150 × 1	50	**PE-B50S**	PE1B50-S	**PE-B50SB**	PE1B50-SB	–	–	–	–

Notes: *PE-B□D: NPN transistor, open collector output
PE-B□Q: PNP transistor, open collector output
PE-B□A: Thyristor output
PE-B□S: Transistor output

■ Ordering information

Specify the following:
1. Type number or ordering code

■ Specifications

Type	**PE-B□D**, **PE-B□DB**	**PE-B□Q**, **PE-B□QB**	**PE-B□S**, **PE-B□SB**	**PE-B□A**, **PE-B□AB**
Output	NPN transistor, open collector output	PNP transistor, open collector output	Transistor, output	Thyristor, output
Supply voltage	12/24V DC *1		12/24V DC *1	120/240V AC *2
Output capacity	Max. 200mA at 12/24V DC (PE-B4D□, PE-B4Q□: Max. 50mA at 12/24V DC)		Max. 100mA	10 to 200mA
Current consumption	Max. 15mA at 24V DC		0.8mA or less (Leakage current)	2mA at 200V AC (Leakage current)
Ambient temperature	–25 to +75°C		–25 to +75°C	–25 to +75°C
Dielectric strength	2000V AC, 1 min.		2000V AC, 1 min.	2000V AC, 1 min.
Insulation resistance	Over 50MΩ (500V DC megger)			
Degree of protection	IP67 (IEC)			
Response frequency	See table below			
Vibration	10 to 55Hz, 1.5mm double amplitude (in X, Y and Z direction, respectively for two hours)			
Shock	500m/s^2			
Circuit protection	Short-circuit (except PE-B□A and PE-B□AB), reverse polarity, surge voltage			

Notes: *1 Operational voltage range: 10 to 30V DC *2 Operational voltage range: 80 to 250V AC.

05

■ Response frequency

DC supply

PE-B7D, PE-B7Q, PE-B7S	300Hz
PE-B4D, PE-B4Q, PE-B4S	200Hz
RE-B10D, PE-B10Q, PE-B10S	

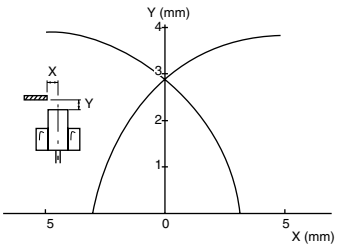
PE-B15D, PE-B20D, PE-B20Q, PE-B20S	100Hz
PE-B30D, PE-B30Q, PE-B30S	50Hz
PE-B50D, PE-B50Q, PE-B50S	10Hz

AC supply

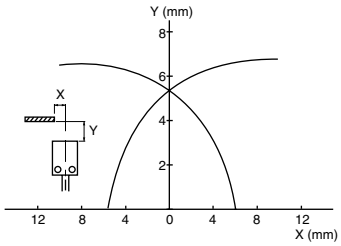
PE-B7A, PE-B10A, PE-B20A	20Hz
PE-B30A, PE-B50A	5Hz

■ Response curve for iron (Typical)

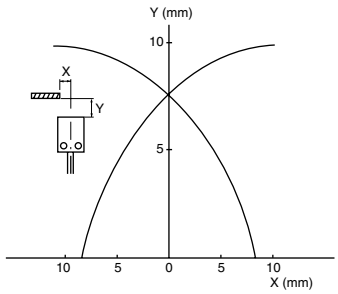
PE-B4□
Material: Iron
20 × 20 × 1mm



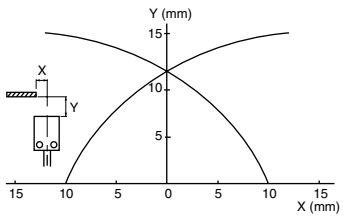
PE-B7□
Material: Iron
30 × 30 × 1mm



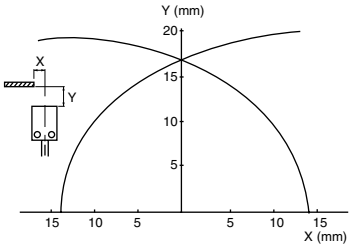
PE-B10□
Material: Iron
40 × 40 × 1mm



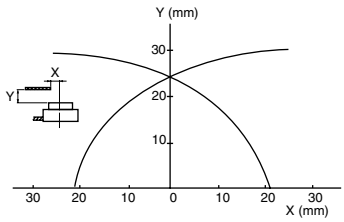
PE-B15□
Material: Iron
50 × 50 × 1mm



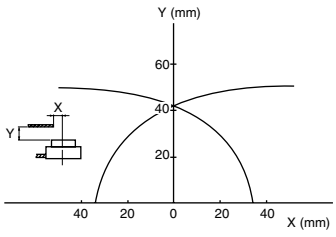
PE-B20□
Material: Iron
50 × 50 × 1mm



PE-B30□
Material: Iron
90 × 90 × 1mm

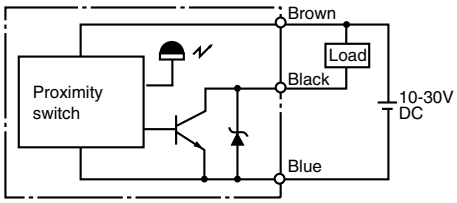


PE-B50□
Material: Iron
150 × 150 × 1mm

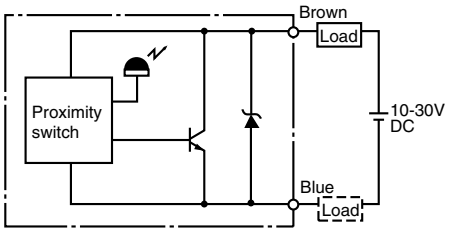


■ Wiring diagrams

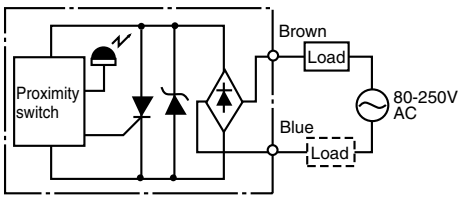
● DC supply/3-wire system
PE-B□D



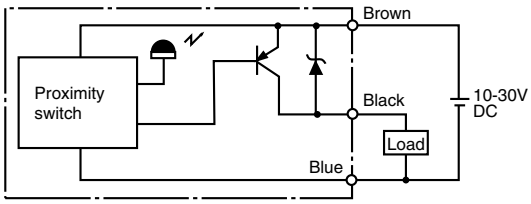
● DC supply/2-wire system
PE-B□S



● AC supply/2-wire system
PE-B□A

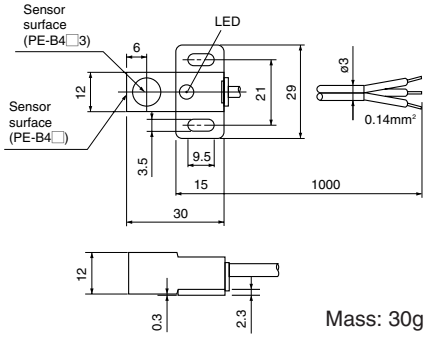


PE-B□Q



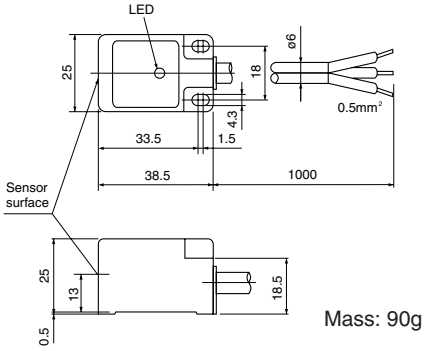
■ Dimensions, mm

PE-B4□, B4□3 PE-B4□B, B4□3B



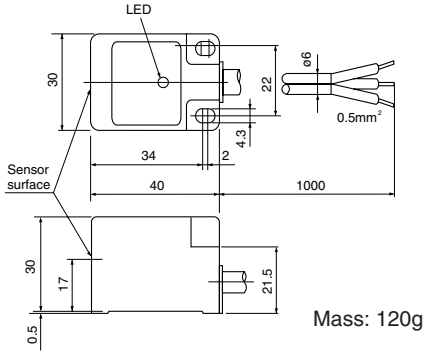
Mass: 30g

PE-B7□, PE-B7□B



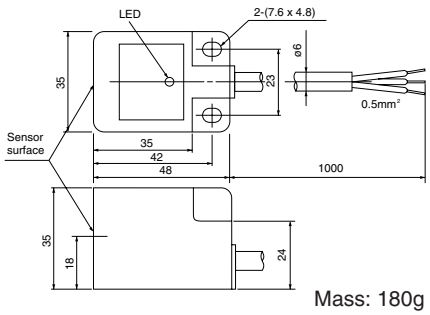
Mass: 90g

PE-B10□, PE-B10□B



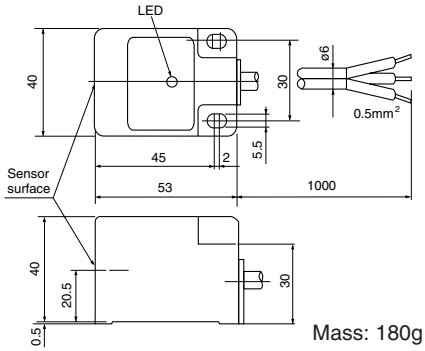
Mass: 120g

PE-B15D, PE-B15DB



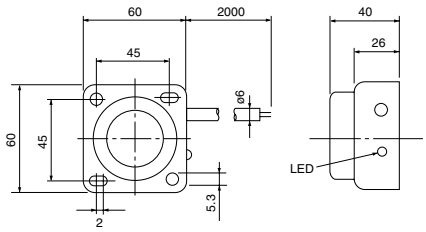
Mass: 180g

PE-B20□, PE-B20□B



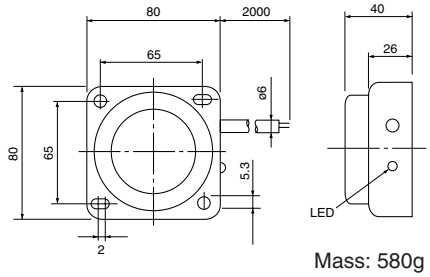
Mass: 180g

PE-B30□, PE-B30□B



Mass: 330g

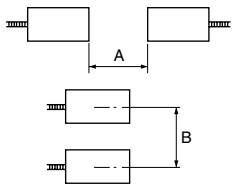
PE-B50□, PE-B50□B



Mass: 580g

■ Mutual interference:

Be sure to space two switches at a distance greater than that shown in the table at right to prevent mutual interference.



Type	A (mm)	B (mm)
PE-B4□	60 (30)	60 (30)
BE-B7□	80 (40)	80 (40)
PE-B10□	120 (60)	120 (60)
PE-B15□	200 (100)	120 (60)
PE-B20□	200 (100)	200 (100)
PE-B30□	300 (150)	300 (150)
PE-B50□	500 (250)	500 (250)

Note: The values in parentheses are applicable when using two switches with oscillation frequencies different from each other.

Inductive proximity switches– Square flat type, PE-X15D

Operating system:
DC supply/3-wire system
Supply voltage range: 10 to 30V DC
Operating distance: 15mm

■ Features

- Degree of protection meets the requirements of IEC IP66, thus permitting operations in unfavorable environment.
- Only two screws are needed to affix each switch, eliminating the need for exclusive mounting brackets.
- Incorporates surge suppression circuits and protection circuits against reverse polarity and short-circuits.

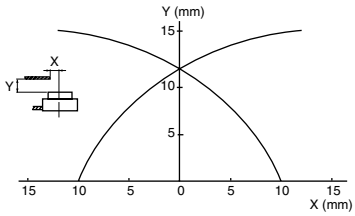
PE-X15D

■ Specifications

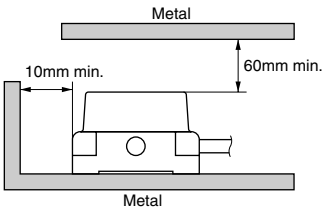
Type (Ordering code)	**PE-X15D**
Operating system	DC supply/3-wire
Output	NPN transistor, open collector, 1NO
Operating distance	15mm ±10%
Target size (iron)	50×50×1mm (iron)
Differential distance	Max. ±10% of operating distance
Rated voltage	12/24V DC (10 to 30V DC)
Switching capacity	200mA max.
Current consumption	15mA max. at 24V DC
Residual voltage	1.5V max. at 24V DC, 200mA
Response frequency	100Hz
Variation due to voltage fluctuation	Max. ±1% of operating distance at 12/24V DC when operated within 10 to 30V DC
Variation due to temperature fluctuation	Max. ±10% of operating distance at 20°C within temperature range of –25 to +70°C
Dielectric strength	1000V AC, 1min.
Insulation resistance	50MΩ or more (500V DC)
Degree of protection	IP66 (IEC)
Ambient temperature	–25 to +70°C (avoid icing)
Humidity	35 to 95% RH
Vibration	10–55Hz, 1.5mm double amplitude
Shock	500m/s² (approx. 50G)

■ Response curve for iron

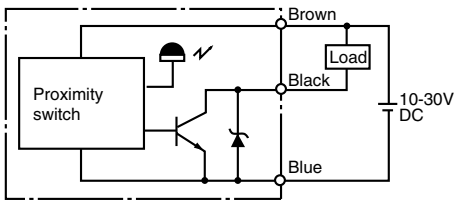
Material: Iron
50×50×1mm



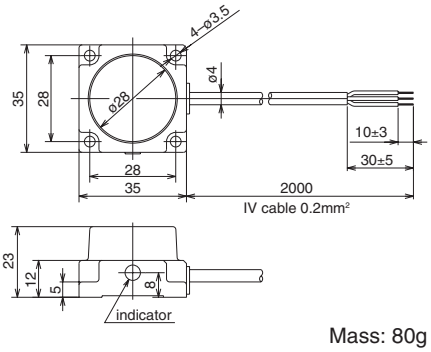
- Influence of surronding metals:
  When mounting a proximity switch surrounded by metals, be sure to provide a minimum distance as shown below.



■ Wiring diagrams



■ Dimensions, mm



Mass: 80g

Inductive proximity switches–Slim type, PE-T
Supply voltage: 12/24V DC
120/240V AC
Output capacity: Max. 200mA

■ Features

- Unusual "Magnetic Shield Method" permits to mount these units side by side, touching each other. (Shielded type PE-TS2)
- Only 12mm in thickness because of the use of IC.
- Wide operating voltage range
  Operating range of supply voltage is from 80 to 250V AC or from 10 to 30V DC.
- LED indicators are provided for all types thus facilitating operation checks.
- Provided with built-in reverse polarity and surge voltage protection circuits.
- Water and oil-tight
  Degree of protection meets the requirements of IEC IP67 thus permitting operations in unfavorable environment.

PE-T AF89-744

■ Ordering information

Specify the following:
1. Type number or ordering code

■ Versions

Description	Operating system	Target size (mm)	Operating distance (mm)	Output 1NO Type	Ordering code	1NC Type	Ordering code
Shielded	DC supply/3-wire	12 × 12 × 1	2	**PE-TS2D** **PE-TS2Q**	PE1T02-D PE1T02-Q	**PE-TS2DB** **PE-TS2QB**	PE1T02-DB PE1T02-QB
	DC supply/2-wire	12 × 12 × 1	2	**PE-TS2S**	PE1T02-S	**PE-TS2SB**	PE1T02-SB
	AC supply/2-wire	12 × 12 × 1	2	**PE-TS2A**	PE1T02-A	—	—
Non-shielded	DC supply/3-wire	20 × 20 × 1	4	**PE-T4D** **PE-T4Q**	PE1N04-D PE1N04-Q	**PE-T4DB** **PE-T4QB**	PE1N04-DB PE1N04-QB
	DC supply/2-wire	20 × 20 × 1	4	**PE-T4S**	PE1N04-S	**PE-T4SB**	PE1N04-SB
	AC supply/2-wire	20 × 20 × 1	4	**PE-T4A**	PE1N04-A	—	—

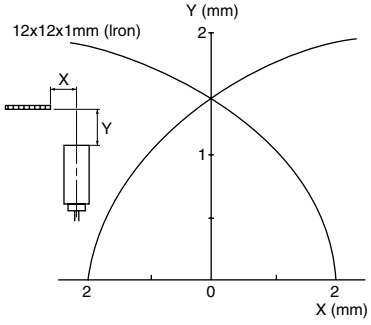
■ Specifications

Type	**PE-TS2D, PE-T4D**	**PE-TS2Q, PE-T4Q**	**PE-TS2S, PE-T4S**	**PE-TS2A, PE-T4A**
Output	NPN transistor, open collector output	PNP transistor, open collector output	Transistor output	Thyristor output
Supply voltage	12/24V DC*1			120/240V AC*2
Output capacity	Max. 200mA			10 to 200mA
Current consumption	Max. 15mA at 24V DC		Max. 0.8mA (Leakage current)	Max. 2mA at 200V AC (Leakage current)
Ambient temperature	–25 to +70°C	–25 to +70°C	–25 to +70°C	–25 to +70°C
Dielectric strength	2000V AC, 1 min.	2000V AC 1 min.	2000V AC, 1 min.	2000V AC 1 min.
Insulation resistance	Over 50MΩ (500V DC)	Over 50MΩ at 500V DC	Over 50MΩ (at 500V DC)	Over 50MΩ (at 500V DC)
Degree of protection	IP67 (IEC)	IP67 (IEC)	IP67 (IEC)	IP67 (IEC)
Response frequency	See table below			

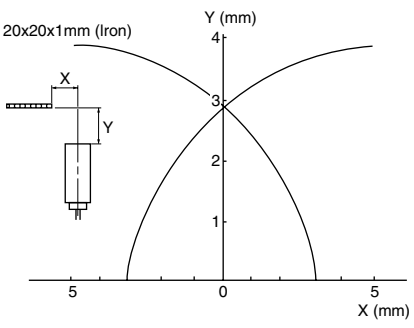
Notes: *1 Operating voltage range: 10 to 30V DC *2 Operating voltage range: 80 to 250V AC.

■ Response curve for iron

PE-TS2□



PE-T4□



■ Response frequency

DC supply types

PE-TS2D, PE-TS2Q PE-TS2S	800Hz
PE-T4D, PE-T4Q PE-T4S	250Hz

AC supply types

PE-TS2A, PE-T4A	20Hz

■ Type number nomenclature

PE – TS 2 – D B

- **Contact**
  Blank: 1NO
  B: 1NC
- **Operating system**
  D: DC, 3-wire, NPN output
  Q: DC, 3-wire, PNP output
  S: DC, 2-wire
  A: AC, 2-wire
- **Operating distance**
  2: 2mm
  4: 4mm
- **Series**
  TS: Shielded, slim type
  N: Non-shielded, slim type
- **Basic type**

■ Ordering code

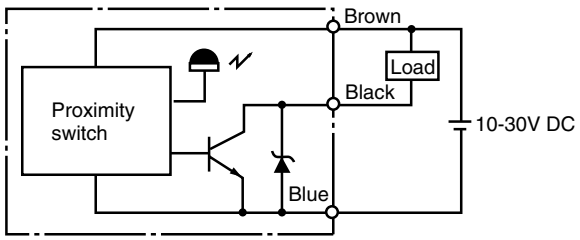
PE1 T 02 – D B

- **Contact**
  Blank: 1NO
  B: 1NC
- **Operating system**
  D: DC, 3-wire, NPN output
  Q: DC, 3-wire, PNP output
  S: DC, 2-wire
  A: AC, 2-wire
- **Operating distance**
  02: 2mm
  04: 4mm
- **Series**
  T: Shielded, slim type
  N: Non-shielded, slim type
- **Basic type**

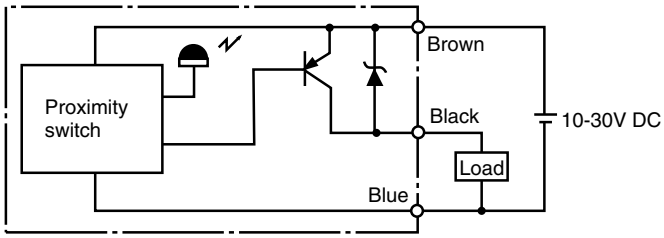
■ Wiring diagrams

● DC supply/3-wire system

PE-T□D

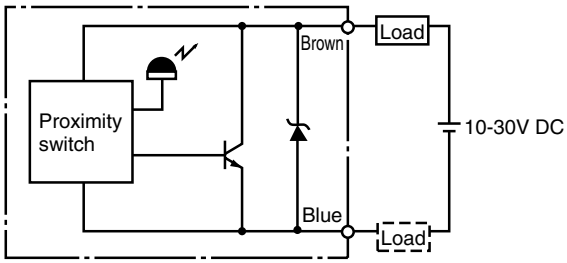


PE-T□Q



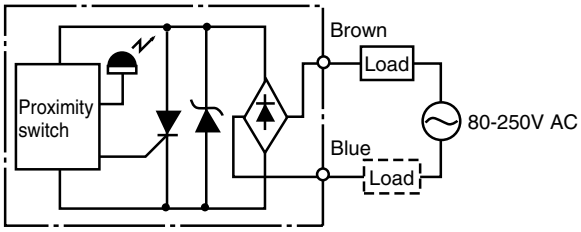
● DC supply/2-wire system

PE-T□S

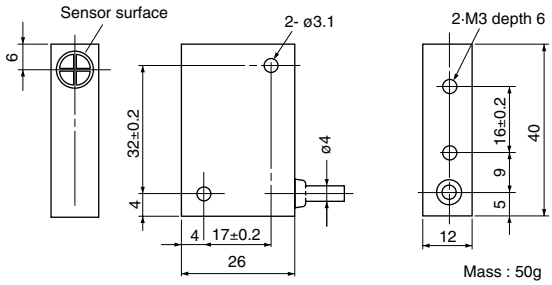


● AC supply/2-wire system

PE-T□A

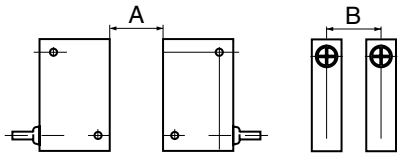


■ Dimensions, mm



■ Mutual interference:

Be sure to space two switches at a distance greater than that shown in the table below to prevent mutual interference.

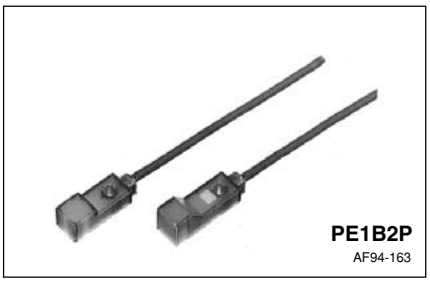


Type	A (mm)	B (mm)
PE-TS2□	24(12)	24(12)
PE-T4□	60(30)	60(30)

Note: The values in parentheses are applicable when using two switches with oscillation frequencies different from each other.

Inductive proximity switches – Compact square type, PE1B2P
Operating system:
DC supply/3-wire system
Supply voltage: 12/24V DC
Operating distance: 2.5mm
Output capacity: 100mA max.

■ Features
- For further improved operability, an extra compact switch enables operation indications to be checked from three directions
- Equipped with surge voltage and reverse polarity protection functions


PE1B2P
AF94-163

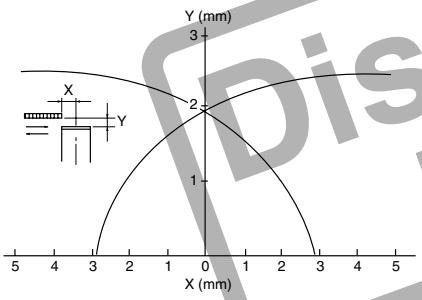
■ Type number nomenclature (Ordering code)
PE1B 2P – D 3

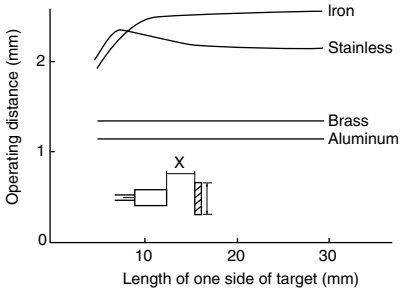
Sensing head direction
Blank: Front (Standard)
3: Surface

Operating system
D: NPN transistor, open collector output

Operating distance
2P: 2.5mm

Basic type

■ Response curve for iron


■ Material of target operating distance


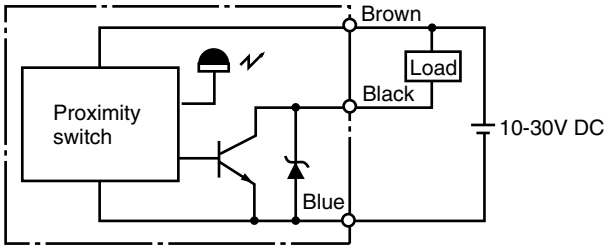
■ Specifications

Type (Ordering code)	**PE1B2P-D**	**PE1B2P-D3**
Sensing head	Front (Standard)	Surface side
Operating system	DC supply/3-wire	
Output	NPN transistor, open collector	
Operating distance	2.5mm ±20%	
Target size	15 x 15 x 1mm, iron	
Differential distance	Max. 10% of operating distance	
Operating voltage	12/24V DC (10 to 30V DC)	
Current consumption	Max. 15mA at 24V DC	
Output capacity	Max. 100mA	
Residual voltage	Max. 1.5V at 24V DC 100mA	
Response frequency	Min. 500Hz	
Ambient temperature	–25 to +70°C	
Humidity	35 to 95% RH	
Protection of circuit	Surge voltage, reverse circuit	
Variation due to temperature fluctuation	Max. ±15% of operating distance at 20°C within a temperature range of –25 to +70°C	
Variation due to voltage fluctuation	Max. ±2% of operating distance at rated voltage when operated within ±15% of power supply voltage	
Dielectric strength	1000V AC 1 min.	
Insulation resistance	Over 50MΩ (500V DC)	
Degree of protection	IP67 (IEC)	
Vibration	10 to 55Hz, double amplitude 1.5mm (in X, Y and Z direction, respectively for 2 hours)	
Shock	500m/s^2	

Discontinued Mar. 2007

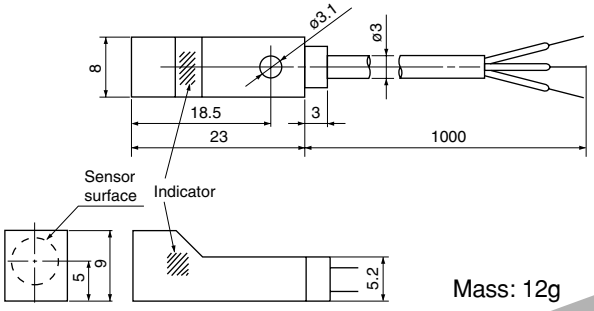
■ Ordering information
Specify the following:
1. Type number or ordering code

■ Wiring diagram



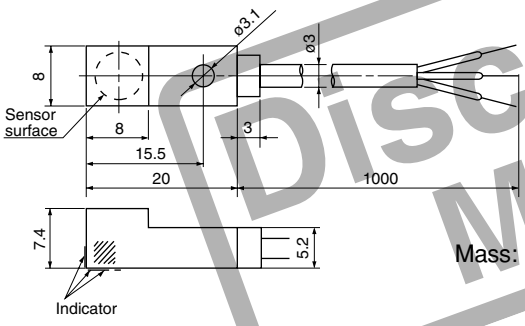
■ Dimensions, mm

PE1B2P-D



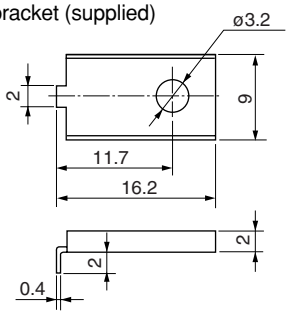
Mass: 12g

PE1B2P-D3



Mass: 12g

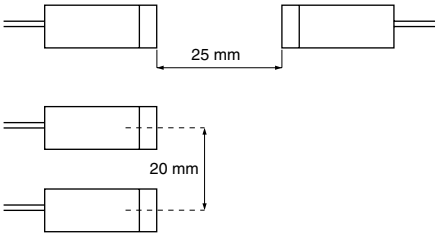
Mounting bracket (supplied)



Notes on use

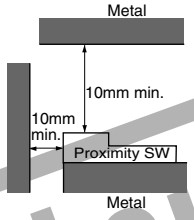
● Mutual interference:

Be sure to space to switches at a distance greater than that shown in the figure below to prevent mutual interference.



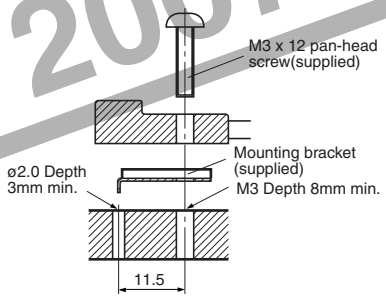
● Influence of surrounding metals:

When mounting a proximity switch surrounded by metals, be sure to provide a minimum distance as shown below.



● Mounting

Use the supplied bracket and screw. Tightening torque is 0.5N•m or less. It is desirable to use a screw locking device together with to prevent the screw from loosening.



Discontinued Mar. 2007

Inductive proximity switches-Analog output type, PE-L

■ Description

These switches are ideally suited for deformation inspections, position controls of laser beam machines and similar displacement measurements and controls of a variety of machines.

■ Features

- Red LED indicator lamp
- Output voltage proportional to the distance from the object.
- The accuracy of linearity is ±1.5% of full scale and the resolution accuracy ±0.05% of full scale, thus permitting a highly accurate measurement and detection of minute displacement of distance.
- Provided with 2 switching output circuits so as to detect an arbitrary position within the detecting range by incorporating a built-in comparator circuit.
- Provided with a SPAN indicator lamp.

PE-LA PE-LS

SP-387

● Sensor

External diameter	Type	Ordering code
M12	**PE-LS2**	PE1L02
M18	**PE-LS5**	PE1L05
M30	**PE-LS10**	PE1L10

● Amplifier unit

12/24V DC Type	Ordering code	110V AC Type	Ordering code	220V AC Type	Ordering code
PE-LA2D	PE1LA02-T	**PE-LA2A/1**	PE1LA02-H	**PE-LA2A/2**	PE1LA02-M
PE-LA5D	PE1LA05-T	**PE-LA5A/1**	PE1LA05-H	**PE-LA5A/2**	PE1LA05-M
PE-LA10D	PE1LA10-T	**PE-LA10A/1**	PE1LA10-H	**PE-LA10A/2**	PE1LA10-M

■ Specifications

● Sensor

Type	PE-LS2	PE-LS5	PE-LS10
Rated operating distance	2mm	5mm	10mm
Standard material of target	Magnetic materials		
Operating distance range Standard target size (Iron) t: thickness Response frequency	0.4–2mm 12 x 12 x 1t 10kHz	1–5mm 18 x 18 x 1t 5kHz	2–10mm 30 x 30 x 1t 2kHz
Ambient temperature Degree of protection	–25 to +70°C IP67 (IEC)		
Mass (Includes a 3m prewired cable)	90g	120g	220g

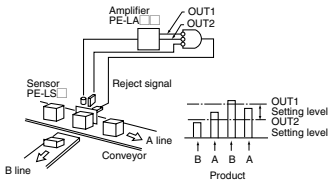
● Amplifier

Description			DC supply	AC supply
Supply voltage			12/24V DC	110, 220V AC, 50/60 Hz*
Power consumption			30mA max.	40mA max.
Analog output characteristic	Resolution Linearity		0.05% of full scale ±1.5% of full scale	
Switching output characteristic	Differential		1 to 5% of rated operating distance	
Adjustment function	Analog output voltage adjustment	1 Volt adj.	Adjustment for output voltage of 1 Volt at 20% of rated operating distance	
		5 Volts adj.	Adjustment for output voltage of 5 Volts at rated operating distance	
	Switching output adjustment	Output 1 adj.	Adjustment for operating position of ON/OFF output	
		Output 2 adj.		
Output	Analog output		1 to 5 Volts	
	Switching output	Output 1 Output 2	NPN transistor output 100mA max. (30V DC)	
Indicator			SPAN indicator, Switching output indicator	
Ambient temperature			–10 to +55°C	
Mass			100g	180g
Socket			TP28S, TP28X, ATX1NS (8-pin)	

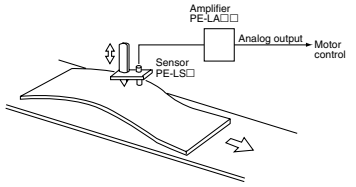
Note: * Operating voltage range 100V: 85-121V AC
200V: 170–242V AC

■ Application examples

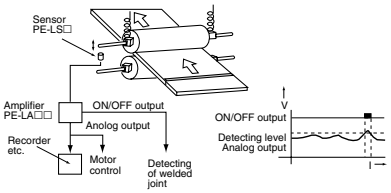
Detecting of height and thickness of product



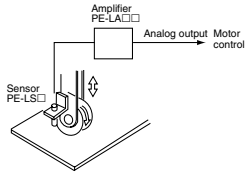
Position control for laser beam machine



Measuring of plate and welded joint thickness



Feed control for grinder wheel



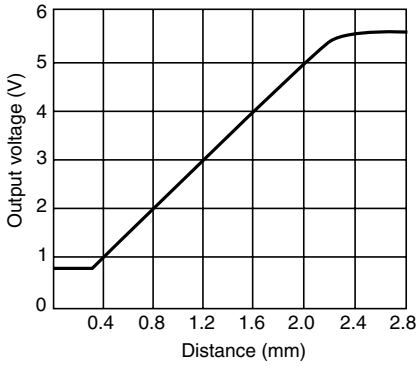
■ Ordering information

Specify the following:
1. Type number (ordering code)

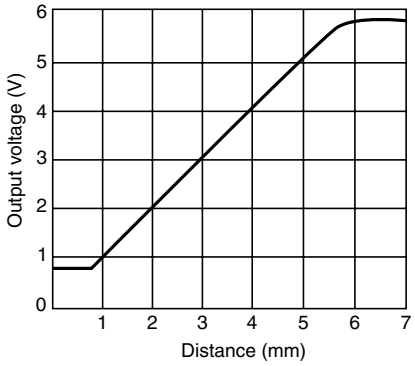
■ Typical characteristic data

Distance-output voltage

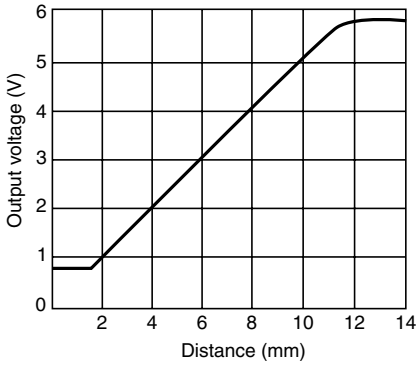
● **PE-LS2**



● **PE-LS5**

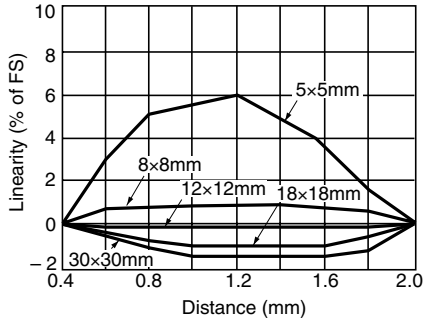


● **PE-LS10**

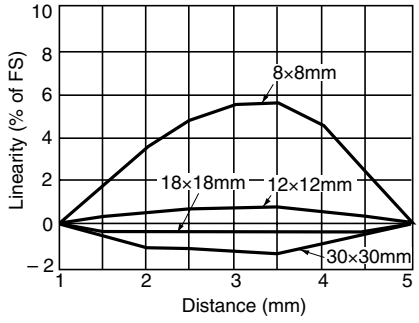


Size of target-Linearity

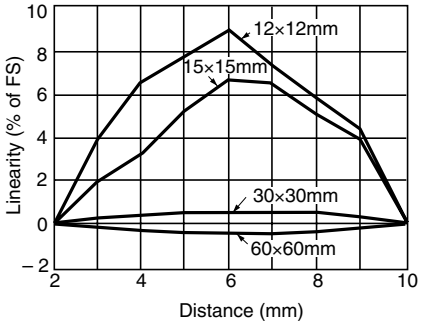
● **PE-LS2**



● **PE-LS5**

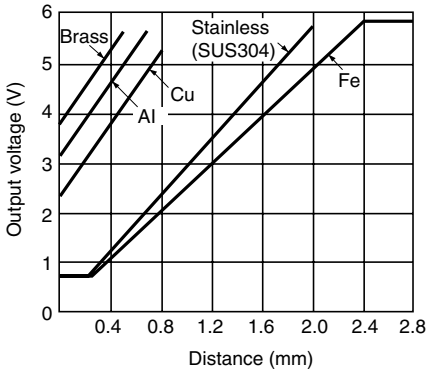


● **PE-LS10**

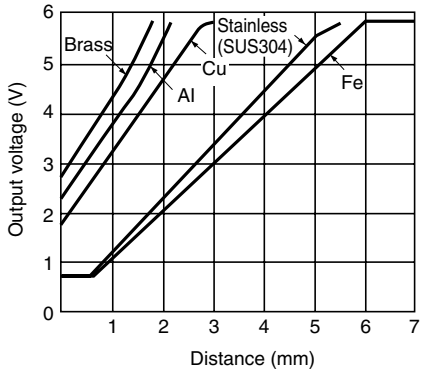


Material of target-Output voltage

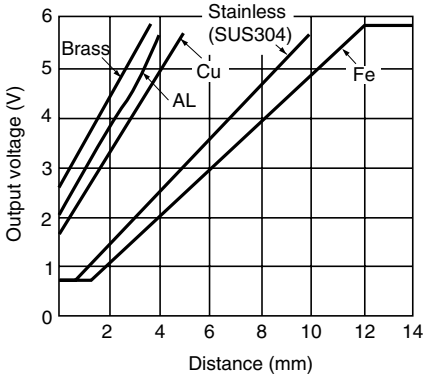
● **PE-LS2**



● **PE-LS5**

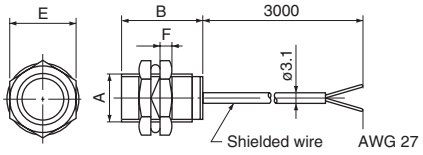


● **PE-LS10**



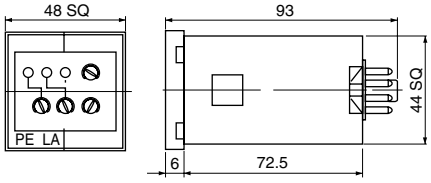
■ Dimensions, mm

● Sensor



Type	A	B	E	F
PE-LS2	M12×1	20	17	4
PE-LS5	M18×1	30	24	4
PE-LS10	M30×1.5	40	36	5

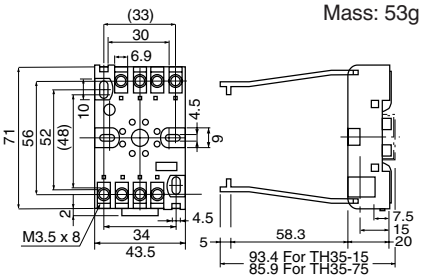
● Amplifier-unit



● Socket/Rail mounting

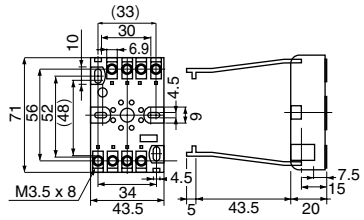
TP28X

Mass: 53g



● Socket/Surface mounting

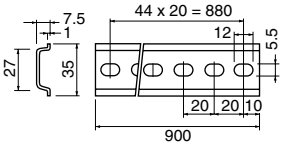
TP28S



Mass: 56g

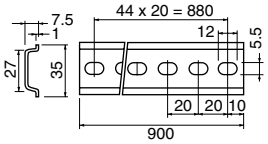
● Mounting rails

TH35-7.5 (Steel)



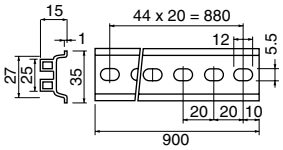
Mass: 290g

TH35-7.5AL (Aluminum)



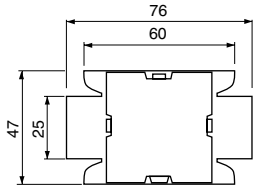
Mass: 140g

TH35-15AL (Aluminum)



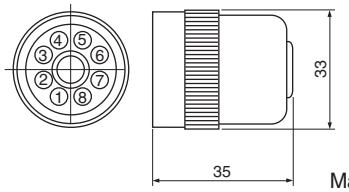
Mass: 220g

● Adaptor/Flush mounting



● Socket/Soldering terminal

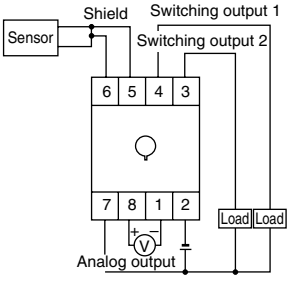
ATX1NS



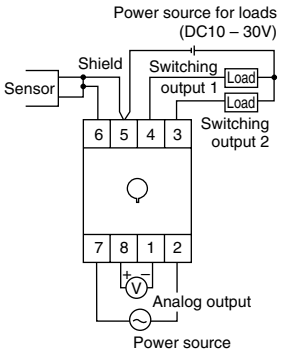
Mass: 18g

■ Wiring diagrams

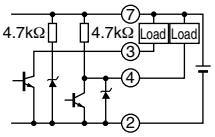
● DC



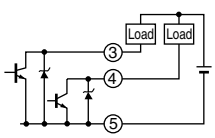
● AC



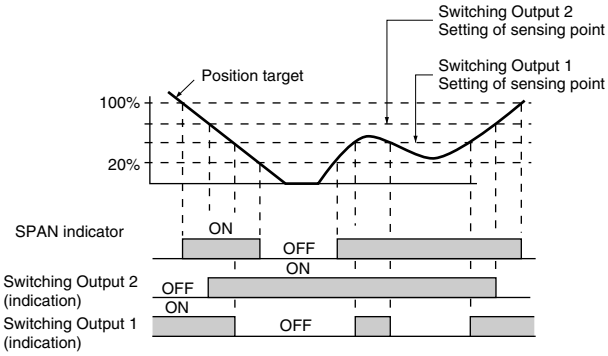
Internal circuit of output (DC)



Internal circuit of output (AC)



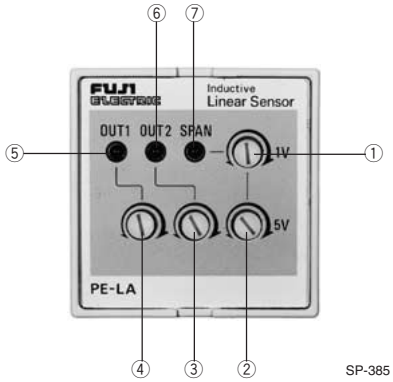
■ Timing diagrams



■ Handling of the amplifier unit

● Indicators and output adjusting dial

PE-LA



① 1V adjusting dial
Used to adjust the output voltage to 1V when the standard size target is positioned at a point 1/5th of the rated operating distance.

② 5V adjusting dial
Used to adjust the output voltage 5V when the standard size target is positioned at the rated operating distance.

③ Operating distance adjusting dial (For switching output 2)

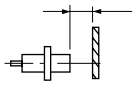
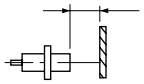
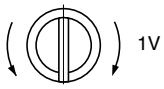
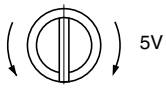
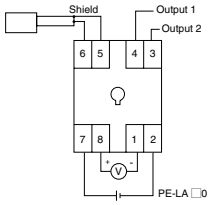
④ Operating distance adjusting dial (For switching output 1)

⑤ Operating indicator (Red)
This lamp is used to indicate the operating state of output 1. (Lights up when the output is ON. Goes out when the output is OFF)

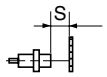
⑥ Operating indicator (Red)
This lamp is used to indicate the operating state of output 2. (Lights up when the output is ON. Goes out when the output is OFF)

⑦ SPAN indicator (Green)
Lights up when the linear output voltage is within the range from 1 to 5 Volts.

● Adjustment of analog output

Order	1	2	3
Position of target	–	1/5th of rated operating distance 	Rated operating distance 
Adjusting dial	–	 1V	 5V
Method of adjusting Method I	Connect voltmeter to terminal 1 and 8 	Position the standard size target to the position at a point 1/5th of the rated operating distance and turn the 1V adjusting dial clockwise slowly (to increase the output voltage) or counterclockwise so that the output voltage is 1V.	Position the standard size target to the position at the rated operating distance and turn the 5V adjusting dial clockwise slowly (to increase the output voltage) or counterclockwise so that the output voltage is 5V.
Method II	–	Position the standard size target at a point 1/5th of the rated operating distance and turn the 1V adjusting dial counterclockwise so that the SPAN indicator goes out, and then turn it clockwise slowly until the SPAN indicator lamp lights up.	Position the standard size target to the position at the rated operating distance and turn the 5V adjusting dial clockwise slowly so that the SPAN indicator goes out, and then turn it counterclockwise until the SPAN indicator lamp lights up.

● Adjustment of sensitivity

Position of target	
Adjusting dial	
Method of adjusting	Position the standard size target in position and turn the detecting distance adjusting dial clockwise slowly until the operation indicator lights up. Move the standard size target so as to check that it operates at the specified position.

Inductive proximity switches– Cylindrical type, PE2-C

The lineup of PE2-C series proximity switches has been augmented by the addition DC 3-wire system switches with NPN and PNP transistor outputs and 2-wire system switches usable for both AC and DC applications.

These new switches are characterized by:
- A stable operating indicator composed of a two-color (red and green) LED that enables easy and reliable setting of detection range
- Smaller dimensions and longer detecting distance due to incorporation of new IC
- Four ways to configure DC 2-wire systems, DC 3-wire systems (which provide NPN and PNP transistor outputs) and two-wire systems usable for both AC and DC applications. This wide choice of configurations makes it possible to choose appropriate switch for the circuit.

The DC 2-wire system
- Reduces wiring cost and labor
- Can be connected to such high impedance load as small relays, PLC, and NC equipment without risk of reset failure due to leakage currents of not exceeding 0.8mA and a residual voltage of 3V.
- Consumes very little current and places no burden on the power supply serving PLC.
  Make a power supply for the sensor unnecessary.
- Enables easy connection on site to load equipment having sink- and source-current input specifications.
- Has protective circuit to protect against short-circuit, reverse polarity, and surges.

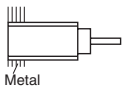
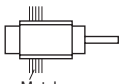
The DC 3-wire system:
- Available in 16 types of units, shielded or unshielded, of varying diameter, and providing two types of output
- Also available with PNP output transistors for European machine tool applications.

PE2-C AF91-505

- Has the same external dimensions as the PE1 series which is not equipped with stable operating indicator.

The 2-wire system switch usable for both AC and DC applications:
- Can be operated from sources from 20 to 250V DC and 40 to 250V AC.
- Reduces wiring cost and labor.
- Is unpolarized, eliminating hazard of reverse polarity connection.

■ **Specifications**

Description	Operating system	Operating distance (mm)	Target size (mm) (iron)	External diameter	Response frequency (Hz)	Supply voltage	Output	Type	Ordering code
Shielded  Metal	DC supply/2-wire, current output	2	8×8×1	M8	1500	12/24V DC	3 to 100mA	**PE2-CSN2S**	PE2S02-S
		3	12×12×1	M12	1000			**PE2-CS3S**	PE2S03-S
		7	18×18×1	M18	500	Operating voltage range 10 to 30V DC		**PE2-CS7S**	PE2S07-S
		10	30×30×1	M30	400		1NO	**PE2-CS10S**	PE2S10-S
	DC supply/3-wire, NPN transistor output	2	8×8×1	M8	1500		200mA max.	**PE2-CS2D**	PE2S02-D
		3	12×12×1	M12	1000			**PE2-CS3D**	PE2S03-D
		7	18×18×1	M18	500			**PE2-CS7D**	PE2S07-D
		10	30×30×1	M30	400		1NO	**PE2-CS10D**	PE2S10-D
	DC supply/3-wire, PNP transistor output	2	8×8×1	M8	1500		200mA max.	**PE2-CS2Q**	PE2S02-Q
		3	12×12×1	M12	1000			**PE2-CS3Q**	PE2S03-Q
		7	18×18×1	M18	500			**PE2-CS7Q**	PE2S07-Q
		10	30×30×1	M30	400		1NO	**PE2-CS10Q**	PE2S10-Q
	AC/DC supply/2-wire, thyristor output	3	12×12×1	M12	1000 (DC) 25 (AC)	24/48/100/200V DC 48/100/200V AC	5 to 100mA	**PE2-CS3W**	PE2S03-W
		7	18×18×1	M18	500 (DC) 25 (AC)	Operating voltage range 20 to 250V DC 40 to 250V AC	1NO	**PE2-CS7W**	PE2S07-W
		10	30×30×1	M30	400 (DC) 25 (AC)			**PE2-CS10W**	PE2S10-W
Non-shielded  Metal	DC supply/2-wire, current output	4	20×20×1	M8	1000	12/24V DC	3 to 100mA	**PE2-C4S**	PE2C04-S
		8	30×30×1	M12	800			**PE2-C8S**	PE2C08-S
		14	30×30×1	M18	400	Operating voltage range 10 to 30V DC		**PE2-C14S**	PE2C14-S
		24	60×60×1	M30	100		1NO	**PE2-C24S**	PE2C20-S
	DC supply/3-wire, NPN transistor output	4	20×20×1	M8	1000		200mA max.	**PE2-C4D**	PE2C04-D
		8	30×30×1	M12	800			**PE2-C8D**	PE2C08-D
		14	30×30×1	M18	400			**PE2-C14D**	PE2C14-D
		24	60×60×1	M30	100		1NO	**PE2-C24D**	PE2C24-D
	DC supply/3-wire, PNP transistor output	4	20×20×1	M8	1000		200mA max.	**PE2-C4Q**	PE2C04-Q
		8	30×30×1	M12	800			**PE2-C8Q**	PE2C08-Q
		14	30×30×1	M18	400			**PE2-C14Q**	PE2C14-Q
		24	60×60×1	M30	100		1NO	**PE2-C24Q**	PE2C24-Q

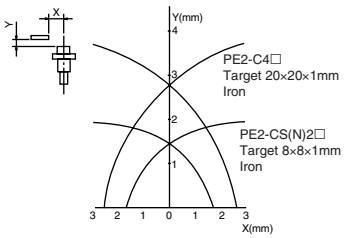
■ Specifications

Type	**PE2-C□S** (DC supply/2-wire)	**PE2-C□D** (DC supply/3-wire)	**PE2-C□Q**	**PE2-C□W** (AC/DC supply/2-wire)
Output	Tranisistor output	NPN transistor, open collector output	PNP transistor, open collector output	Thyristor output
Ambient temperature	–25 to 80°C (no icing)			
Differential distance	Max. ±10% of operating distance			
Variation due to temperature fluctuation	Max. ±10% of operating distance at 20°C within a temperature range of –25 to 70°C			
Variation due to voltage fluctuation	Max. ±2% of operating distance at rated voltage when operated within ±15% of power supply voltage			
Current consumption	—	25mA max. (at 24V DC)		—
Leakage current	0.8mA max. (at 24V DC)	—		0.8mA max. (at 24V DC), 1.3mA max. (at 240V AC)
Residual voltage	3V max. (at 100mA)	1.5V max. (at 24V DC, 200mA)		6V max. (DC), 10V max. (AC)
Dielectric strength	1000V AC, 1 minute			
Insulation resistance	50MΩ or more (500V DC megger)			
Degree of protection	IP67 (IEC Standards)			
Vibration	10–55Hz, 1.5mm double amplitude (in X, Y, Z direction respectively for 2 hours)			
Shock	500m/s^2			
Circuit protection	Short-circuit, reverse polarity, surge voltage			Surge voltage

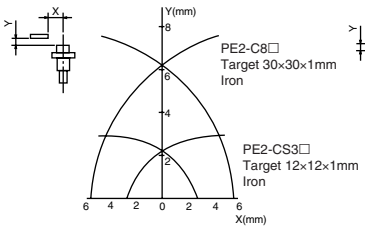
05

■ Response curve for iron (Typical)

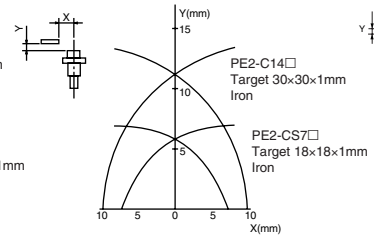
PE2-CS(N)2□
PE2-C4□



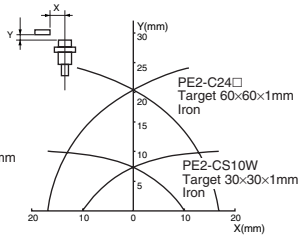
PE2-CS3□
PE2-C8□



PE2-CS7□
PE2-C14□

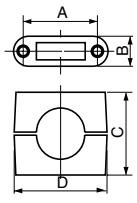


PE2-CS10W
PE2-C24□



■ Accessories (optional)

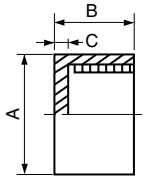
● Mounting bracket



Type (Ordering code)	A (mm)	B (mm)	C (mm)	D (mm)	Screw	Used with
PX1-P8 (PE1Z0037)	18	10	18	28	M4×20	PE2-CS(N)2□ PE2-C4□
PX1-P12 (PE1Z0033)	24	12.5	20	37	M4×25	PE2-CS3□ PE2-C8□
PX1-P18 (PE1Z0034)	32	17	30	47	M5×32	PE2-CS7□ PE2-C14□
PX1-P30 (PE1Z0035)	45	17	50	60	M5×50	PE2-CS10W PE2-C24□

● Sensor surface cover

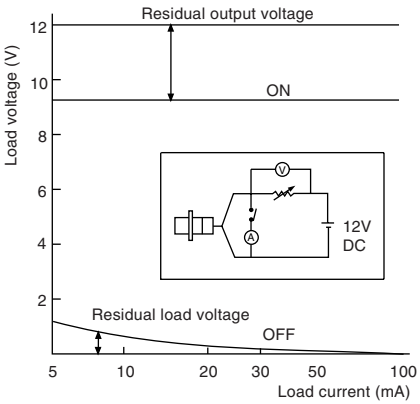
KK02-301A



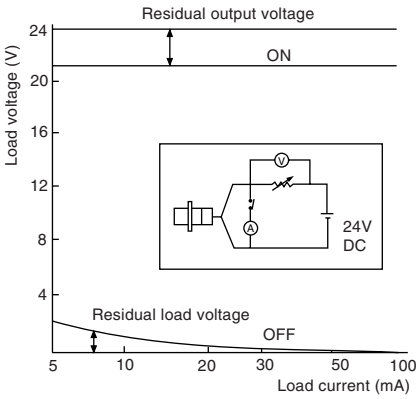
Type (Ordering code)	A (mm)	B (mm)	C (mm)	Used with
PX1-C12S (PE1Z0030)	ϕ15	5	0.6	PE2-CS3□
PX1-C18S (PE1Z0031)	ϕ22.5	8	1.1	PE2-CS7□
PX1-C30S (PE1Z0032)	ϕ35	12	1.6	PE2-CS10W

■ Residual voltage characteristics

PE2-CS□S, C□S, 12V DC

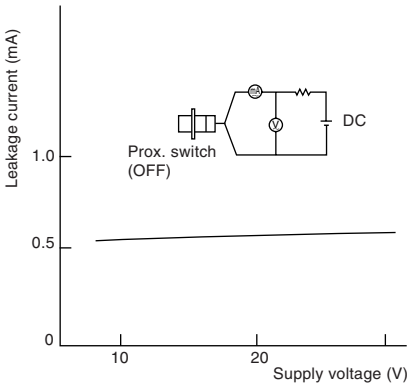


PE2-CS□S, C□S, 24V DC

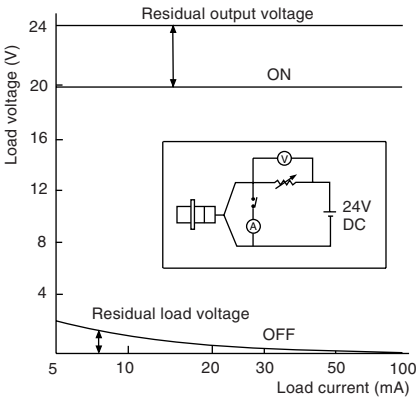


■ Leakage current characteristics

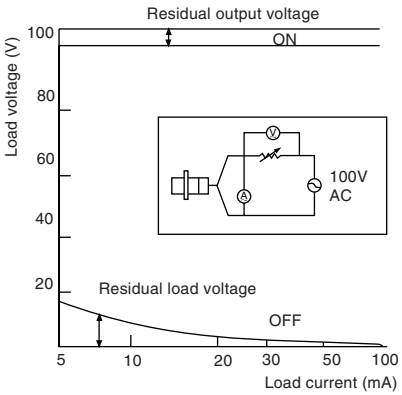
PE2-CS□S, C□S



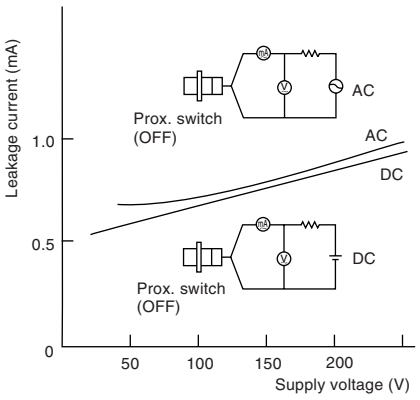
PE2-CS□W, 24V DC



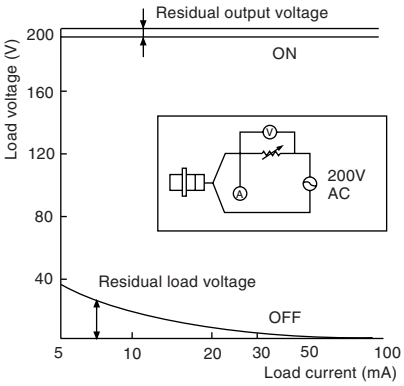
PE2-CS□W, 100V AC



PE2-CS□W



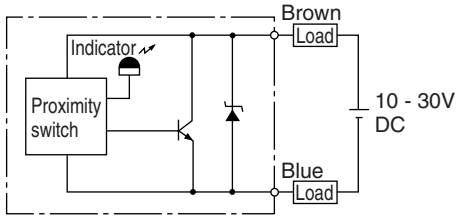
PE2-CS□W, 200V AC



■ Wiring diagrams

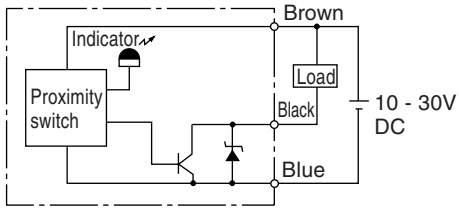
● DC supply/2-wire system

PE-C□S



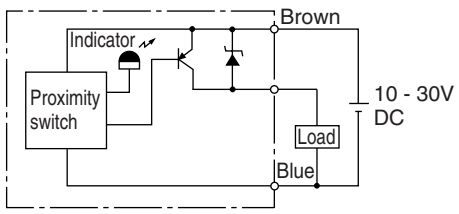
● DC supply/3-wire system

PE2-C□N NPN output



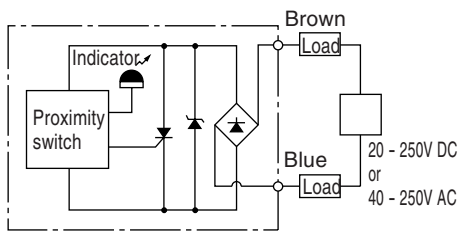
● DC supply/3-wire system

PE2-C□P PNP output



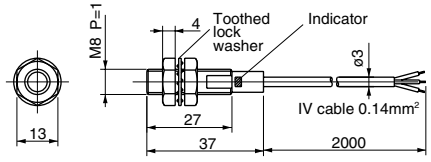
● AC/DC supply/2-wire system

PE2-C□W



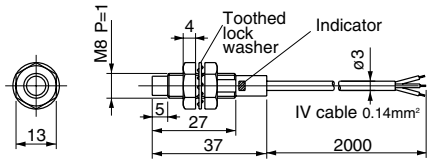
■ Dimensions, mm

PE2-CSN2S, PE2-CS2□



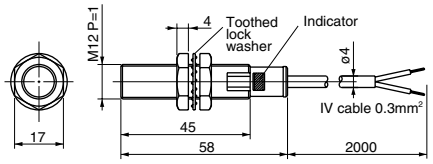
Mass: 40g

PE2-C4□



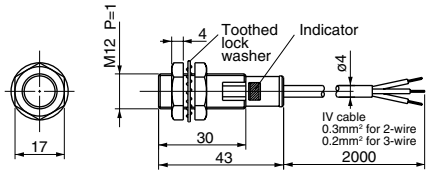
Mass: 40g

PE2-CS3W



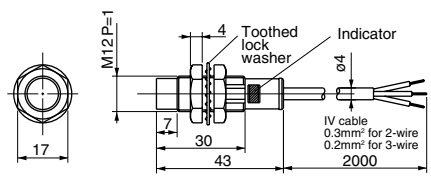
Mass: 100g

PE2-CS3□



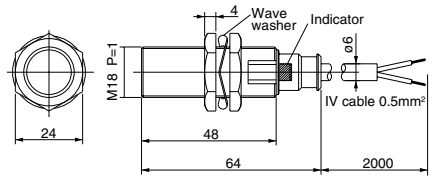
Mass: 70g

PE2-C8□



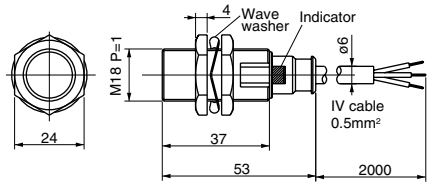
Mass: 70g

PE2-CS7W



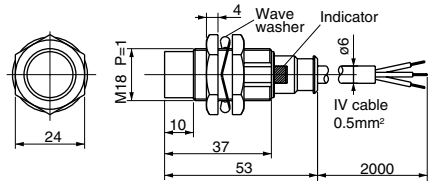
Mass: 170g

PE2-CS7□



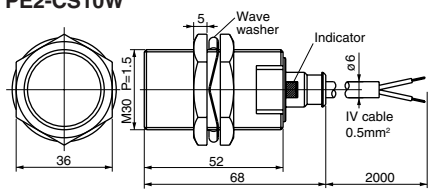
Mass: 160g

PE2-C14□



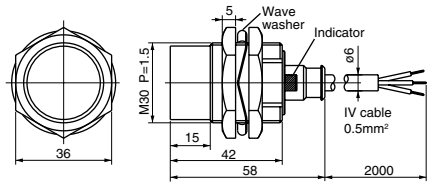
Mass: 160g

PE2-CS10W



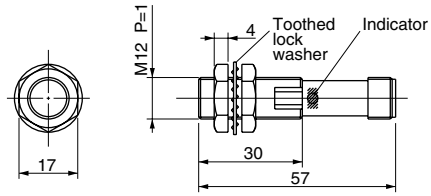
Mass: 340g

PE2-C24□



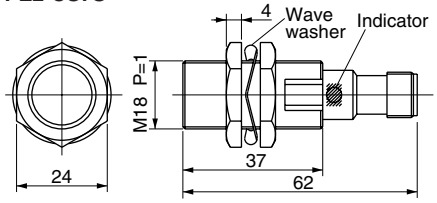
Mass: 280g

PE2-CS3S



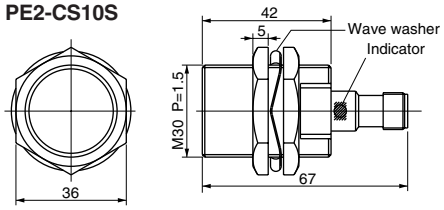
Mass: 30g

PE2-CS7S



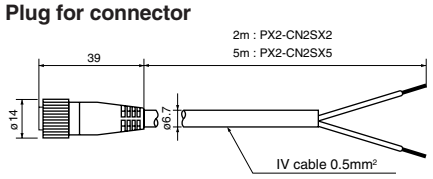
Mass: 60g

PE2-CS10S



Mass: 170g

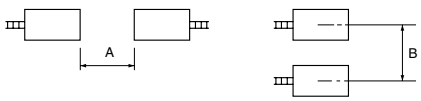
Plug for connector



Note: A mark band is attached when the oscillation frequency differs from that of standard products.

■ Mutual interference:

Be sure to space two switches at a distance greater than that shown in the table at right to prevent mutual interference.



Type	A (mm)	B (mm)
PE2-CS(N)2□	20	15
PE2-CS3□	30 (15)	20 (12)
PE2-CS7□	50 (25)	35 (18)
PE2-CS10W	100 (50)	70 (35)
PE2-C4□	80	60
PE2-C8□	120 (60)	80 (40)
PE2-C14□	200 (100)	120 (60)
PE2-C24□	350 (175)	250 (125)

Note: The values in parentheses are applicable when using two switches with oscillation frequencies different from each other.

■ Ordering information

Specify the following:
1. Type number or ordering code

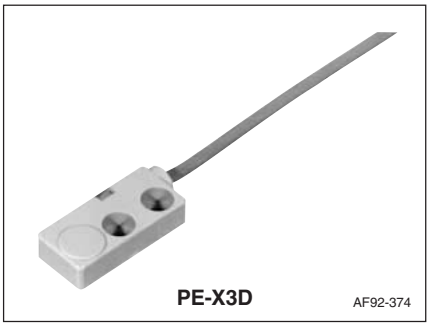
Inductive proximity switches–Flat type, PE-X3D

Easy-to-mount thin inductive type proximity switches

Operating system:
DC supply/3-wire system
Operating distance: 3mm

■ Features

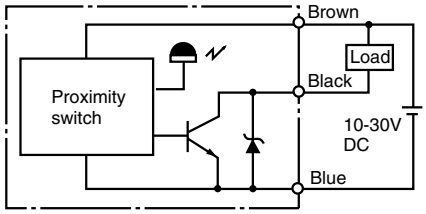
- A mere 7mm height
- Only two screws are needed to affix each switch, eliminating the need for exclusive mounting brackets
- Incorporates a stable operating level indicator
- Equipped with surge suppression circuits and protection circuits against reverse polarity



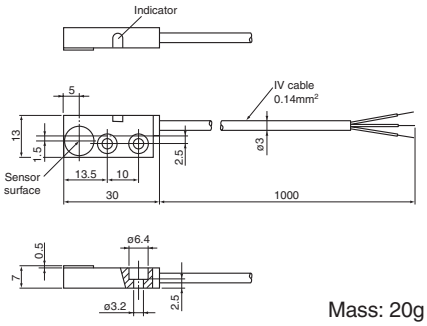
■ Specifications

Type (Ordering code)	**PE-X3D** (PE1X03-D)
Operating system	DC supply/3-wire
Output	NPN transistor, current output, 1NO
Operating distance	3mm ±10%
Target size	12 × 12 × 1mm (iron)
Differential distance	Max. ±10% of operating distance
Power supply voltage	12/24V DC
Operating voltage range	10 to 30V DC
Current consumption	15mA max. at 24V DC
Switching capacity	100mA max.
Residual voltage	1.5V max. at 24V DC 100mA
Response frequency	50Hz or more
Ambient temperature	–25 to +70°C (no icing)
Humidity	35 to 95% RH
Circuit protection	Surge voltage, reverse polarity
Variation due to temperature fluctuation	Max. ±10% of operating distance at 20°C within temperature range of –25 to +70°C
Variation due to voltage fluctuation	Max. ±1% of operating distance at 12/24V DC when operated within 85% to 115% of power supply voltage
Dielectric strength	1000V AC, 1 min.
Insulation resistance	50MΩ (500V DC)
Degree of protection	IP66 (IEC Standard)
Vibration	10–55Hz, 1.5mm double amplitude
Shock	500m/s^2

■ Wiring diagram

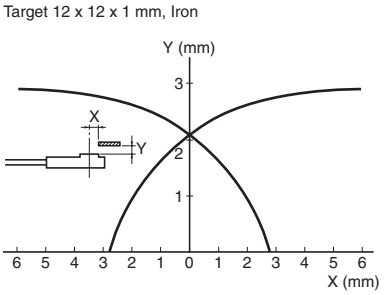


■ Dimensions, mm

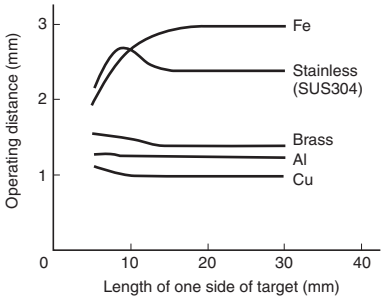


Mass: 20g

■ Response curve for iron

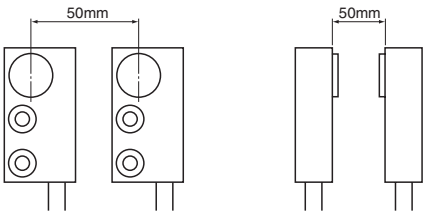


■ Material of target–Operating distance



■ Mutual interference

Be sure to space two switches at a distance greater than that shown in the figure below to prevent mutual interference.



■ Ordering information

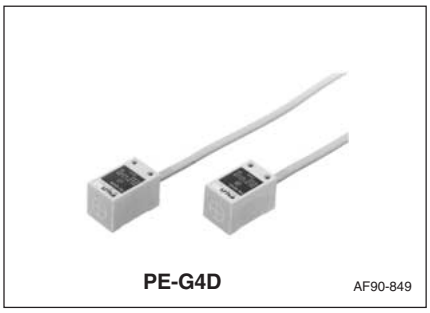
Specify the following:
1. Type number or ordering code

Inductive proximity switches– Square type, PE-G4D

Operating system:
DC supply/3-wire system
Supply voltage range: 10 to 30V DC
Operating distance: 4mm

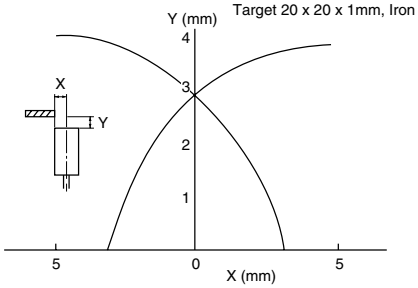
■ Features

- Degree of protection meets the requirements of IEC IP67, thus permitting operations in unfavorable environment.
- Only two screws are needed to affix each switch, eliminating the need for exclusive mounting brackets.
- Incorporates surge suppression circuits and protection circuits against reverse polarity and short-circuits.



PE-G4D AF90-849

■ Response curve for iron

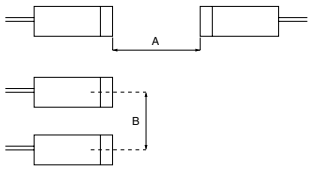


■ Specifications

Type (Ordering code)	**PE-G4D (PE1G04-D)**
Operating system	DC supply/3-wire
Output	1NO
Operating distance	4mm ±10%
Target size (iron)	20×20×1mm
Differential distance	Max. ±10% of operating distance
Rated voltage	12/24V DC (10 to 30V DC)
Switching capacity	50mA max.
Current consumption	15mA max. at 24V DC
Residual voltage	1.5V max. at 50mA
Response frequency	200Hz
Variation due to voltage fluctuation	Max. ±1% of operating distance at 12/24V DC when operated within 10 to 30V DC
Variation due to temperature fluctuation	Max. ±10% of operating distance at 20°C within temperature range of –25 to +70°C
Dielectric strength	2000V AC, 1min.
Insulation resistance	50MΩ or more (500V DC)
Degree of protection	IP67 (IEC)
Ambient temperature	–25 to +70°C (no icing)
Humidity	35 to 95% RH
Vibration	10–55Hz, 1.5mm double amplitude
Shock	500m/s^2

■ Mutual interference

Be sure to space two switches at a distance greater than that shown in the figure below to prevent mutual interference.

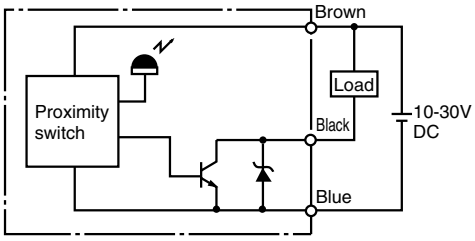


Type	A (mm)	B (mm)
PE-G4D	60	60

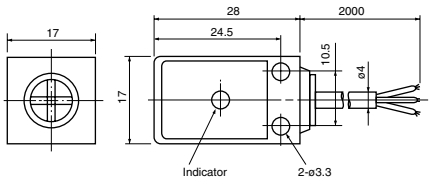
■ Ordering information

Specify the following:
1. Type number or ordering code

■ Wiring diagrams



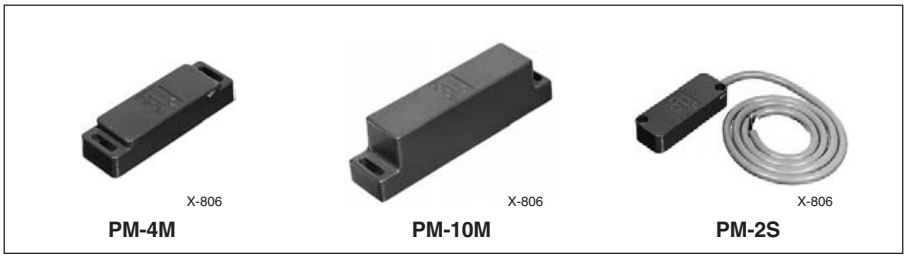
■ Dimensions, mm



Mass: 40g

Magnetically operated reed switches
PM

Magnetically operated reed switches, PM
Standard type
Operating distance: Maximum 35, 70, 120mm
Reed switch: 1NO, 2 Amps



PM-4M **PM-10M** **PM-2S**

■ Features

- Power source not required
- Comprises sensing magnetic element and reed switch
- Resin molded construction
- Water- and dust-tight, shock-resistant
- Breaking capacity: 0.5Amps at 220V AC
- Operating distance is longer than oscillating type.
- Economically priced
- 1 meter color-coded lead wires

■ Ordering information

Specify the following:
1. Type number or ordering code (Specify reed switch and magnet separately.)

■ Specifications

Magnet (standard type)

Type	PM-2M	PM-4M	PM-10M
Operating distance	25 – 40mm	50 – 70mm	80 – 120mm
Differential	5 – 15mm	5 – 20mm	15 – 40mm
Ambient temperature	–10° to +65°C	–10° to +65°C	–10° to +65°C

Magnet (High temperature using type)

Type	PM-2MH	PM-4MH	PM-10MH
Operating distance	25 – 40mm	40 – 70mm	100 – 140mm
Differential	5 – 15mm	5 – 20mm	15 – 40mm
Ambient temperature	–20° to +130°C	–20° to +130°C	–20° to +130°C

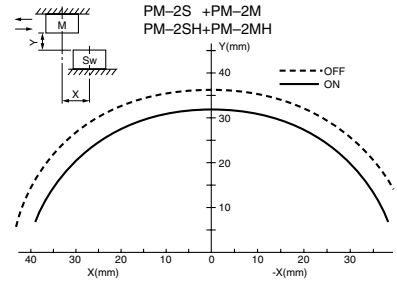
PM2S, PM-2SH read switches

Rated operating voltage: 220V AC, DC (Max.)
Rated operating current: 0.5A (Max.)
Make and break capacity: 50W DC, 50VA AC (Max.)

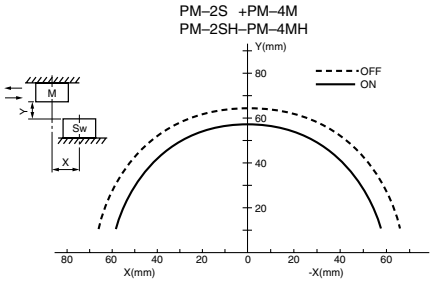
Mechanical: durability 100 million operations
Electrical: 2 million operations at 200V AC 0.125A
1.4 million operations at 100V AC 0.25A
Insulation resistance: Over 100MΩ at 500V DC
Dielectric strength: 700V AC rms. 1 minute (Contact to contact)
Ambient temperature: –10 to +65°C (For 130°C use is also available)
1 meter lead wires are normally provided.

■ Response curves, typical

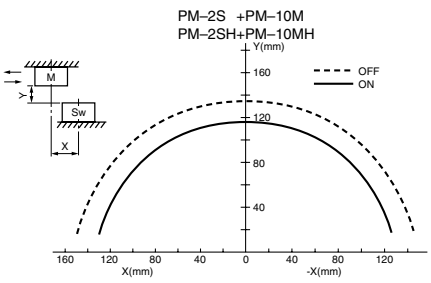
Short axis
M: Magnet
Sw: Reed switch



PM-2S



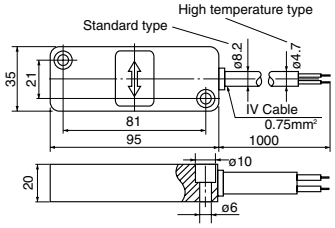
PM-2S



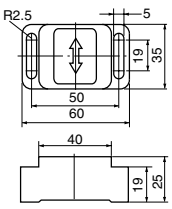
PM-2S

■ Dimensions, mm

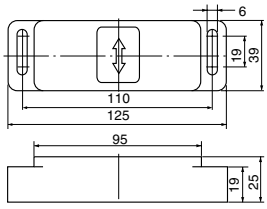
PM-2S Mass: 210g
PM-2SH



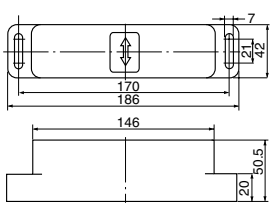
PM-2M Mass: 170g
PM-2MH



PM-4M Mass: 440g
PM-4MH



PM-10M Mass: 1300g
PM-10MH



Notes: • Reed switch and magnetic element are mounted on anti-magnetic material. The operating distance will be decreased when mounted on magnetized materials.
• Both reed switch and magnetic element cannot be used in over 5-gauss magnetic fields.

Magnetically operated reed switches–Slot type PM1U

■ Features

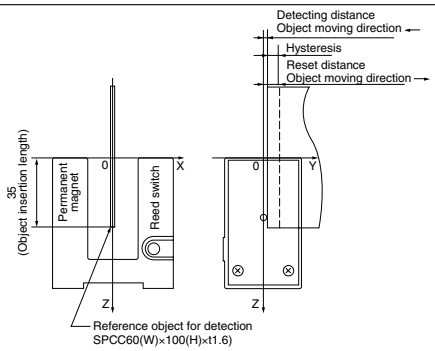
- Stable switch operation is ensured by inserting the object for detection 35mm into the switch slot.
  Ideal for detecting the position of a ferromagnetic-material plate passing in the switch slot.
- Magnetically operated switch using a sealed contact is never affected by electrical noise, ensuring highly reliable detection.
- The built-in permanent magnet enables switching of both AC and DC signals without using a power supply.
- Models with an output indicator are also available.
- Our advanced design assures superior environmental protection complying with IP67 (IEC).

PM1U KK02-304A

■ Ordering information

Specify the following:
1. Type number (ordering code)

■ Specifications

Operating slot width	Detecting distance*	Hysteresis	Contact arrangement	Output indicator	Type (=Ordering code)	Measurement conditions for an operating position and hysteresis
25mm	+4 ±6mm	10mm (Max.)	1NO (ON: Detected)	Not provided	**PM1U-25ALF**	
				Provided	**PM1U-25ALF2**	
	–4 ±6mm	7mm (Max.)	1NC (OFF: Detected)	Not provided	**PM1U25BLF**	
				Provided	**PM1U-25BLF2**	

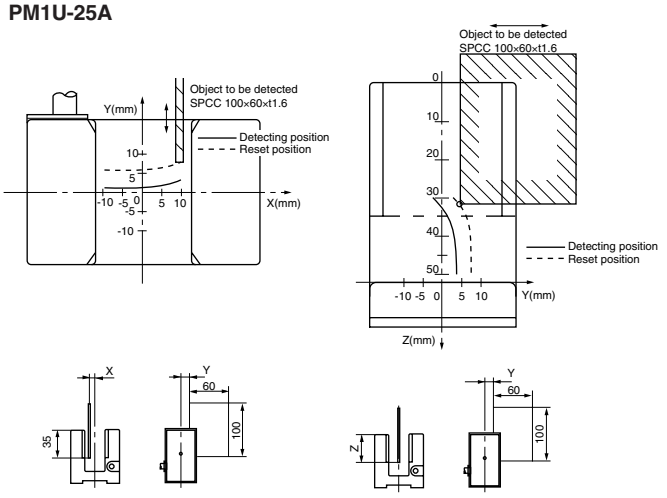
Note *: The detecting distance and hysteresis are defined in the standard detecting conditions shown above.

Type	**PM1U-25ALF**	**PM1U-25ALF2**	**PM1U-25BLF**	**PM1U-25BLF2**
Output indicator	Not provided	Provided	Not provided	Povided
Operating slot width	25mm			
Object insertion length	35mm (Min.)			
Rated operating voltage	220V AC, DC (Max.)			
Rated operating current	0.2A (Max.)			
Make and break current	0.2A (Max.)			
OFF → ON response time	2ms (Max.)			
ON → OFF response time	0.5ms (Max.)			
Life expectancy (Mechanical)	1×10^7 operations (Min.)			
Life expectancy (Electrical)	2×10^6 operations (Min.) Load: Miniature control relay HH54P 220V AC/7mA			
	3×10^6 operations (Min.) Load: Miniature control relay HH54P 100V AC/14mA			
	2×10^6 operations (Min.) Load: Resistance (24V DC/0.2A)			
	1×10^7 operations (Min.) Load: Resistance (12V DC/0.2A)			
Ambient temperature	–10 to +65°C			
Humidity	45 to 95%HR			
Vibration resistance	10 to 55Hz, 1.5mm peak-to peak amplitude, 2-hour for each of X, Y, and Z axes			
Shock resistance	300m/s², three-time for each of X, Y, and Z axis			
Output resistance at ON	6Ω (Max.)	–	6Ω (Max.)	–
Switch residual voltage at ON	–	4V (Max.)	–	4V (Max.)
Insulation resistance	100MΩ (Min.)			
Degree of protection	IP67 (IEC standard)			
Maximum signal cable length	300m			

Note: The LED indicator becomes dark when the load current is 10mA or less. (Switches with an output indicator)
1 meter lead wire is provided.

■ Object detection area (Examples)

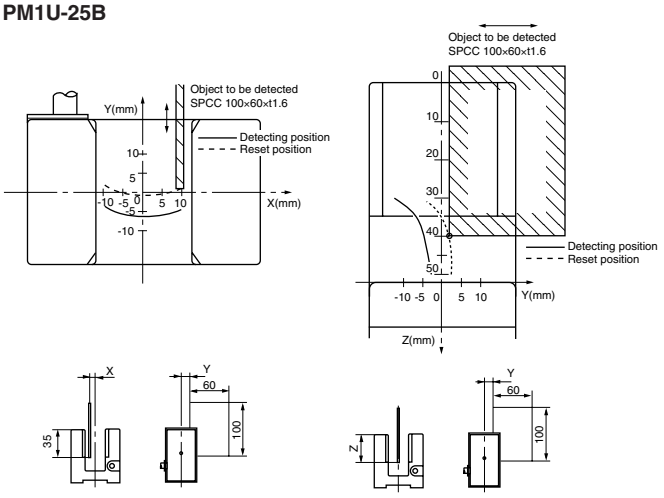
PM1U-25A



Note: The X - Y characteristics are symmetrical to the X axis.

Note: The Y - Z characteristics are symmetrical to the Z axis.

PM1U-25B

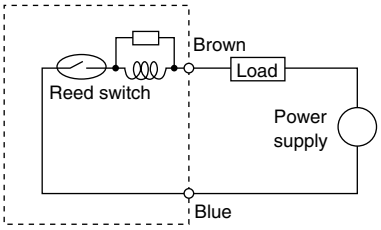


Note: The X - Y characteristics are symmetrical to the X axis.

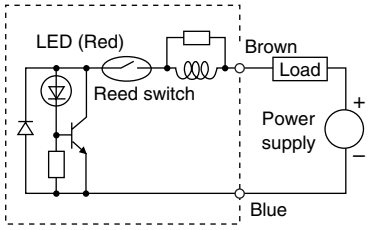
Note: The Y - Z characteristics are symmetrical to the Z axis.

■ Wiring diagrams

Switch with no output indicators



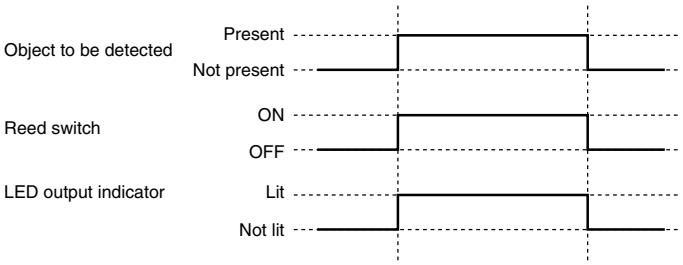
Switch with an output indicator



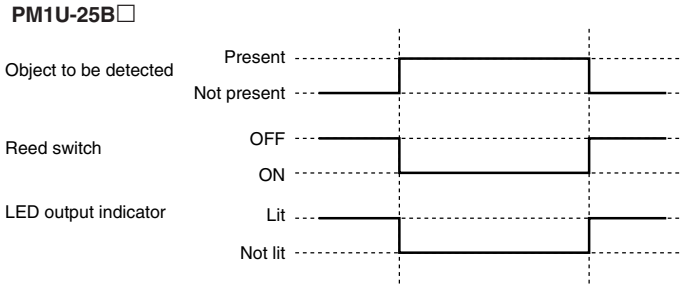
Note: When using a DC power supply, connect the brown terminal to (+) and blue terminal to (0V). Otherwise, the indicator will not go on.

■ Operation chart

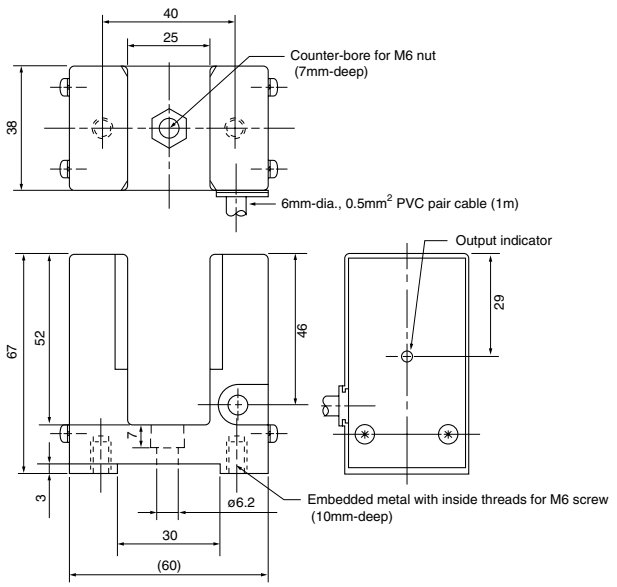
PM1U-25A□



PM1U-25B□



■ Dimensions, mm



Magnetically operated reed switches AES

Small size

Operating distance: Max. 20, 27mm
Reed switch: 1NO
Rated thermal current: 2.5A (AES402)
2.5A (AES502)

■ Features

- Power source is not required.
  AES402 is small size, soldering terminal.
  AES502 is provided with lead wire.
- Epoxy resin molded, shock-resistant.
- Make and break capacity:
  Max. 50VA, 50W (AES402)
  Max. 50VA, 50W (AES502)
- Operating voltage:
  Max. 220V AC, DC (AES402)
  Max. 220V AC, DC (AES502)

■ Ordering information

Specify the following:
1. Type number or ordering code

■ Specifications

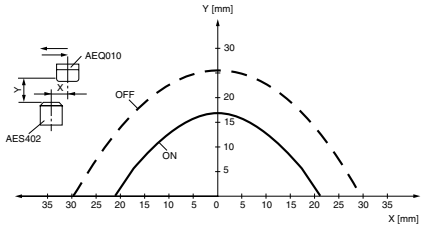
Type		Contact Magnet	**AES402B-1A** **AEQ010-1A**	**AES502L-3A** **AEQ020-1T**
Ordering code		Contact Magnet	PM2B PM34	PM2D PM35
Contact			1NO	
Operating distance Differential			14–20mm 1–12mm	20–27mm 1–14mm
Repeat accuracy			0.5mm or less	
Ambient temperature			–20°C to +80°C	
Dielectric strength Between open contacts Terminal to ground			700V AC, 1 min. 1500V AC, 1 min.	350V AC, 1 min. 1500V AC, 1 min.
Insulation resistance			100MΩ or more at 500V DC	100MΩ or more at 500V DC
Life expectancy	Mechanical		10 million operations	
	Electrical		2 million operations at 100V AC 3.3VA	2 million operations at 100V AC 3.3VA

05

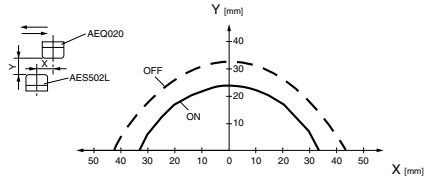
■ Response curves

Short axis

Contact: AES402B-1A
Magnet AEQ010-1A

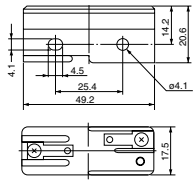


Contact: AES502L-3A
Magnet AEQ020-1T

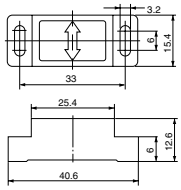


■ Dimensions, mm

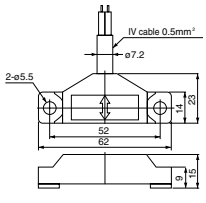
AES402B-1A



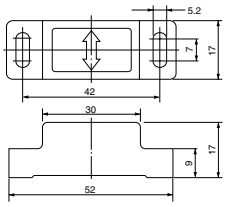
AEQ010-1A



AES502L-3A



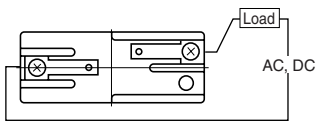
AEQ020-1T



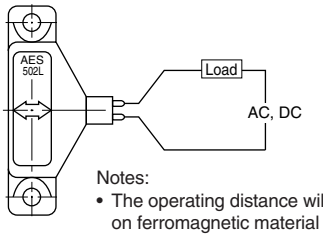
Mass:
AES402B-1A: 20g
AES502L-3A: 85g
AEQ010-1A: 20g
AEQ020-1T: 25g

■ Wiring

AES402B-1A



AES502L-3A



Notes:
- The operating distance will be decreased when mounted on ferromagnetic material such as iron.
- Both reed switch and magnetic elements can not be used in over 5-Gauss magnetic fields.

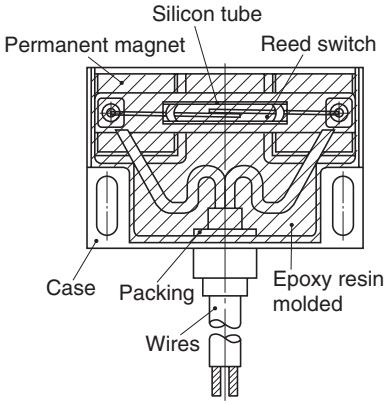
Magnetically operated reed switches
AER

Magnetically operated reed switches AER
Operating distance: 4.0–5.5mm (at 1NO)
Reed switch: 1NO or 1NC
Rated thermal current: 2.5A

■ Features

- Sensing magnetic element and reed switch element are integrated in an epoxy molded housing.
- Power source is not required.
- Travelling direction of the metal object is not limited.
- Make and break capacity: Max. 50VA AC, 50W DC
- Operating voltage: Max. 220V AC, DC
- Water- and dust-tight

■ Construction



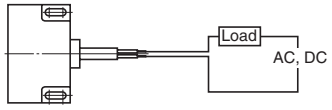
Notes: • The operating distance will be decreased when mounted on ferromagnetic material such as iron.
• This switch cannot be used in over 5-Gauss magnetic fields.
• Keep a distance of over 100mm from other limit switches.

■ Specifications

Type (Ordering code)		**AER201L-1A** (PM1A)	**AER211L-1A** (PM1B)
Contact arrangement		1NO	1NC
Rated voltage AC, DC		220 max.	220V max.
Rated thermal current		2.5A	2.5A
Make and break current		Max. 0.5A AC, DC	Max. 0.5A AC, DC
Operating distance		4.0–5.5mm	3.5–5.0mm
Differential		1–5.5mm	1–5.5mm
Repeat accuracy		Less than 0.5mm	Less than 0.5mm
Ambient temperature		–20° to +80°C	–20° to +80°C
Dielectric strength		350V AC rms. 1 minute (Between open contacts)	
		1500V AC rms. 1 minute (Terminal to ground)	
Insulation resistance		Over 100MΩ at 500V DC	
Life expectancy	Mechanical	10 million operations	
	Electrical	2 million operations at 100V AC 3.3VA (Inductive)	
		2 million operations at 100V DC 1.6W (Inductive)	
		10 million operations at 12V DC 6W (Resistive)	

Notes: • 1 meter lead wires are normally provided.
• The standard detected object is iron plate of 50 × 50 × 2 (mm). If the object is smaller, the operating distance is reduced.

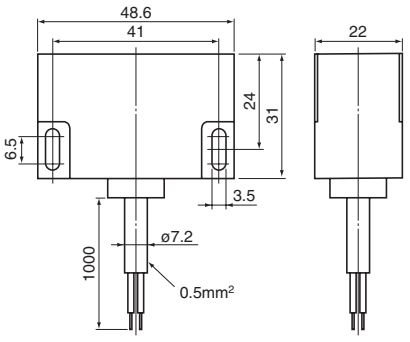
■ Wiring



■ Ordering information

Specify the following:
1. Type number or ordering code

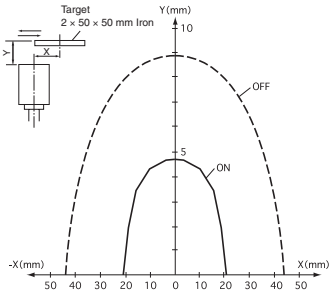
■ Dimensions, mm



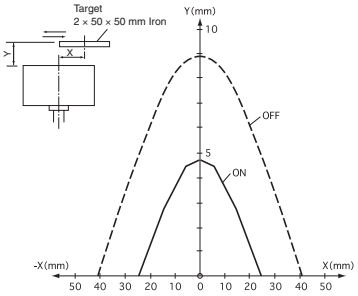
Mass: 100g

■ Response curves

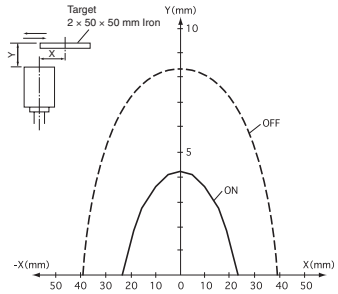
AER20 Short axis



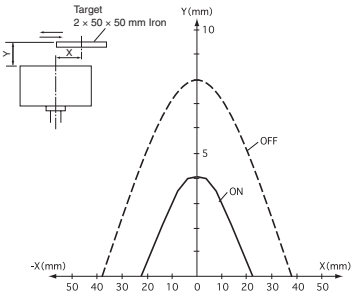
AER20 Long axis



AER21 Short axis



AER21 Long axis

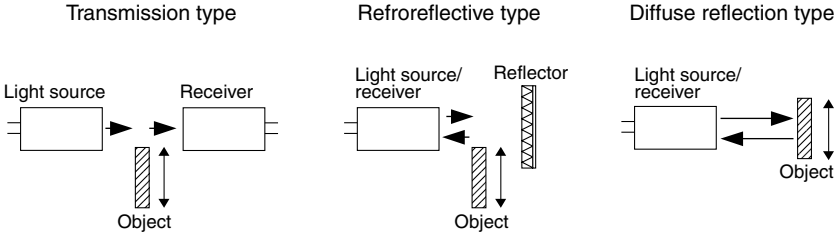


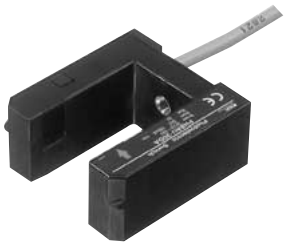
Selection guide

Basic type	**PH21A**	**PH1C**
Photo	AF91-669	XX03-013A
Description	A slim photoelectric switch with a built-in amplifier. Offers a fine sensitivity adjustment function as a standard feature. Useful for the detection of small objects and objects having insufficient contrast.	Highly compact photoelectric switch with dimensions of 10.8x31x20mm. Energy saving design with long-distance detection and a built-in amplifier. Meets CE Mark requirements.
Detecting method	Transmission type Diffuse reflection type	Transmission type Retroreflective type Diffuse reflection type
Operation mode	Dark-ON/Light-ON selectable	Dark-ON/Light-ON selectable
Special function	Self-diagnosis Fine sensitive adjustment	–
Supply voltage	10 to 30V DC	12 to 24VDC ± 10% (ripple ± 10% or less)
Output configuration	Detecting: NPN transistor, voltage/current output Self-diagnosis: NPN transistor, open collector output	Detecting: NPN transistor, open collector output
Output (switching capacity)	100mA max. (Self-diagnosis output: 50mA max.)	100mA max.
Detectable object (material)	Transparent, opaque, black line against white background	Transparent, opaque
Detecting distance	*See page 05/134*	1m, 3m, 4m, 10m
Response time	Operation: 1ms Reset: Approx. 40ms	1ms
Ambient temperature	Operation: –25 to +55°C Storage: –40 to +70°C	Operation: –25 to +55°C Storage: –40 to +70°C
Degree of protection	IP66 (IEC)	IP67 (IEC)
Page	*05/155*	*05/163*

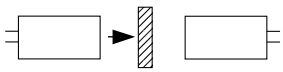
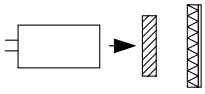
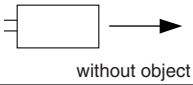
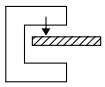
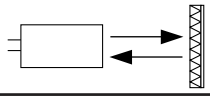
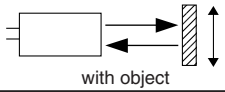
Discontinued
Mar. 2007

■ Detecting method



Basic type	**PH4C**	**PH8AU**
Photo	XX03-002A	 KK02-303A
Description	AC/DC dual supply voltage. Highly compact with dimensions of 18 x 50 x 50mm. Retroreflective type equipped with mirror surface rejeciton function	Slot-type photoelectric switches ideal for conveyor applications, such as elevators and multi-level parking lifts. Same mounting method as our slot-type magnetically operated reed switches (type PM1U).
Detecting method	Transmission type Retroreflective type Diffuse reflection type	Slot type
Operation mode	Dark-ON or Light-ON	Dark-ON or Light-ON
Special function	–	–
Supply voltage	24 to 240V AC±10% 12 to 240V DC±10% (ripple ±10% or less)	10 to 30V DC
Output configuration	Relay output	NPN transistor, open collector output
Output (switching capacity)	3A max. (250V AC res. load) 10mA max. (5V DC)	–
Detectable object (material)	Transparent, opaque	Opaque
Detecting distance	30cm, 2.5m, 3.5m, 4m, 5m	30mm
Response time	30ms max.	1ms or less
Ambient temperature	Operation: –25 to +55°C Storage: –30 to +70°C	Operation: -25 to +55°C Storage: -30 to +70°C
Degree of protection	IP64 (IEC)	IP66 (IEC)
Page	*05/168*	*05/172*

■ Operation mode

	Transmission type	Retroreflective type	Diffuse reflection type	Slot type
Dark-ON (operates when light is interrupted)			 without object	
Light-ON (operates when light is incident)			 with object	without object

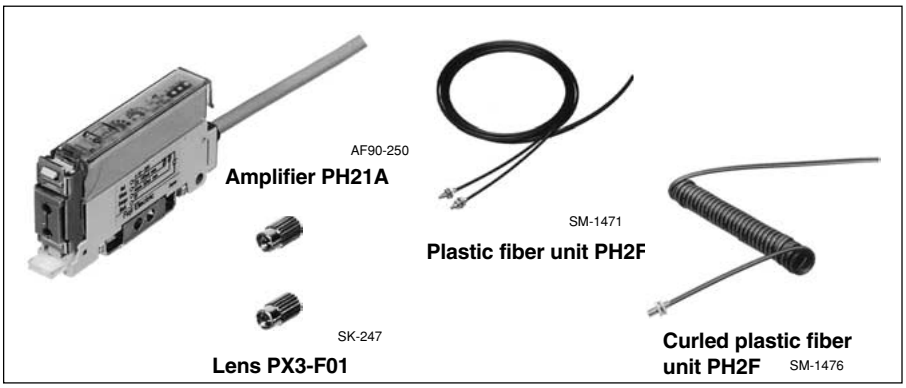
Photoelectric switches
PH21A series

■ Description

PH21A are optical fiber type photo-electric switches and they are provided with a built-in amplifier.
PH21A amplifier is used with PH2F type plastic fiber unit.
A response time as fast as 1ms. is possible, thus permitting detection of rapidly moving objects.
Objects can be detected from far way as 100cm max. when switches are used with lens attachment.

■ Features

- High-speed response time of 1ms.
- Provided with built-in amplifier
- Provided with stable operating level indicator and output indicator
- Provided with short-circuit current protective function
- Wide supply operating voltage range from 10 to 30V DC
- Can be mounted on 35mm DIN and IEC rails
- Provided with fine sensitivity adjustment dial



■ Ordering information

Specify the following:
1. Type number or ordering code

■ Specifications

● Amplifier unit

Type	PH21A-PRN PH21A-PRND	PH21A-PGN PH21A-PGND	PH21A-PIN PH21A-PIND
Ordering code	PH7A-AN PH7A-AND	PH7A-BN PH7A-BND	PH7A-SN PH7A-SND
Light emitting element	Red LED	Green LED	Infrared LED
Supply voltage	10 to 30V DC (Peak must be within this range)		
Current consumption	50mA or less		
Output Detecting output Self-diagnosis function (light level indicating) output	 Load current 100mA max. (NPN transistor, voltage/current output) LIGHT ON/DARK ON selectable (changeover switch) Load current 50mA max. (for D types) (NPN transistor, open collector output)		
Response time	1ms operation/reset (for D type, operation: 1ms reset: 30 to 70ms)		
Indicator	Operation indicator (Red LED) Stable operating level indicator (Green LED)		
Ambient operating illumination	Incandescent lamp: 3000 lx or less at receiving surface Sun light: 10000 lx or less at receiving surface		
Ambient temperature	Operating: –25°C to +55°C (no icing)*1 Storage: –40°C to +70°C		
Degree of protection	IP66 (IEC)*2		
Insulation resistance	20MΩ min. (500V DC megger)		
Dielectric strength	1000V AC 50/60Hz, 1 minute		
Vibration	10 to 55Hz, 1.5mm double amplitude		
Shock	500m/s^2		
Mass	70g	70g	70g

Notes: *1 Ambient temperature range is –25°C to 50°C when the units are mounted side-by-side on the rail.
*2 Degree of protection is IP50, when amplifier unit is used with the fiber unit type PH2F-TB3, TB3S, DB3, DB3S, DC6 or DC6S.
See page 05/161 for self-diagnosis and 05/162 for fine sensitivity adjustment functions.

■ Type number nomenclature

● Amplifier unit

PH21A-P R N D

Special function
Blank : Without self-diagnosis function
D : With self-diagnosis function

Output
N : DC 3-wire system (NPN transistor, voltage/current output)

Light emitting element
R : Red LED
G : Green LED
I : Infrared LED

Type of fiber connector
P : For polyester sheath

Basic type
Fiber type built-in amplifier

● Fiber unit

PH2F-D A 6 S

Fiber shape
Blank : Standard
S : With stainless sleeve

Mounting screw size
3 : M3
4 : M4
6 : M6

Material of fiber
Blank : Standard plastic fiber
A : Coaxial plastic fiber
B : Fine plastic fiber
C : Curled plastic fiber
L : Plastic fiber for long range

Detecting method
T : Transmission type
D : Diffuse reflection type

Basic type
PH2F : Plastic fiber unit

Discontinued Mar. 2007

■ Specifications

● Plastic fiber unit

Detecting method	Fiber unit (Length of cable: 2 m) Shape	Mounting screw	Type	Ordering code	Mass (g)*
Transmission type	Standard	M4	**PH2F-T4**	PH7XFTN4	23
	Standard	M3	**PH2F-T3**	PH7XFTN3	23
	Standard (for long range)	M4	**PH2F-TL4**	PH7XFTL4	24
	With stainless sleeve	M4	**PH2F-T4S**	PH7XFTS4	24
	Curled	M4	**PH2F-TC4**	PH7XFTC4	30
	Curled with stainless sleeve	M4	**PH2F-TC4S**	PH7XFTX4	30
	Fine	M3	**PH2F-TB3**	PH7XFTB3	11
	Fine with stainless sleeve	M3	**PH2F-TB3S**	PH7XFTW3	11
Diffuse reflection type	Standard	M6	**PH2F-D6**	PH7XFDN6	24
	Standard (for long range)	M6	**PH2F-DL6**	PH7XFDL6	24
	Coaxial	M6	**PH2F-DA6**	PH7XFDA6	24
	With stainless sleeve	M6	**PH2F-D6S**	PH7XFDS6	25
	Curled	M6	**PH2F-DC6**	PH7XFDC6	30
	Curled with stainless sleeve	M6	**PH2F-DC6S**	PH7XFDX6	30
	Fine	M3	**PH2F-DB3**	PH7XFDB3	10
	Fine with stainless sleeve	M3	**PH2F-DB3S**	PH7XFDW3	10

* Including fiber cable cutter (5g)

● Accessories and detecting distance

Fiber unit type	Accessories to be used	Type	Ordering code	Detecting distance **PH21A-PRN** **PH21A-PRND**	**PH21A-PGN** **PH21A-PGND**	**PH21A-PIN** **PH21A-PIND**	Detectable object
PH2F-T4	–	–	–	15cm	25mm	12mm*	Opaque ø1mm min.
	Lens	**PX3-F01**	PH7X-F1	100cm			Opaque ø3mm min.
	Side viewer	**PX3-F02**	PH7X-F2	15cm			Opaque ø2mm min.
PH2F-T3	–	–	–	15cm	25mm	12mm*	Opaque ø1mm min.
	Spot viewer	**PX3-F03**	PH7X-F3	2cm			White mat paper 10 × 10mm
PH2F-TL4	–	–	–	30cm	50mm	25mm*	Opaque ø1.5mm min.
PH2F-T4S	–	–	–	15cm	25mm	12mm*	Opaque ø1mm min.
PH2F-TC4	–	–	–	10cm			Opaque ø1mm min.
	Lens	**PX3-F01**	PH7X-F1	60cm			Opaque ø3mm min.
	Side viewer	**PX3-F02**	PH7X-F2	10cm			Opaque ø2mm min.
PH2F-TC4S	–	–	–	10cm			Opaque ø1mm min.
PH2F-TB3	–	–	–	3.5cm			Opaque ø0.5mm min.
PH2F-TB3S	–	–	–	3.5cm			
PH2F-D6	–	–	–	5cm	8mm	4mm*	White mat paper 3 × 3cm
PH2F-DL6	–	–	–	6.5cm	15mm	8mm*	
PH2F-DA6	–	–	–	5cm	8mm	4mm*	
PH2F-D6S	–	–	–	5cm	8mm	4mm*	
PH2F-DC6	–	–	–	1.5cm			
PH2F-DC6S	–	–	–	1.5cm			
PH2F-DB3	–	–	–	1.2cm			White mat paper 1.5 × 1.5cm
PH2F-DB3S	–	–	–	1.2cm			

Operating and storage ambient temperature range: –40°C to +70°C

* Indicates detecting distance when 2m long fiber cable is used.

■ Supplied accessories

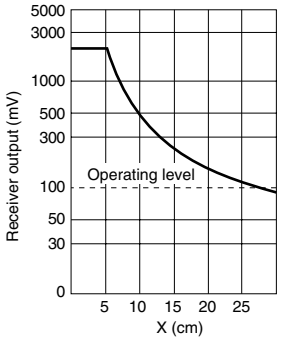
Description	Type (Ordering code)	Packed with
Mounting bracket	**PX32-P3F**	All PH21A amplifier
Plastic fiber cable cutter	**PX3-Z1 (PH7XA)**	Fiber unit

Discontinued Mar. 2007

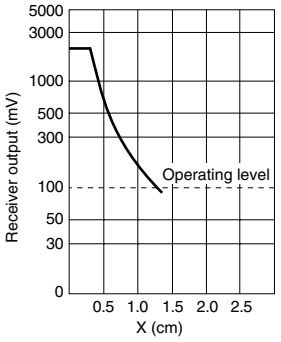
■ Typical characteristic data/PH21A-PRN, PRND

● Receiver output–Distance

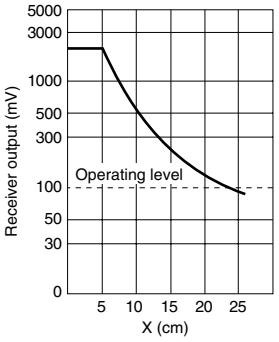
Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-T4**



Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-T4**
Lens: **PX3-F01**

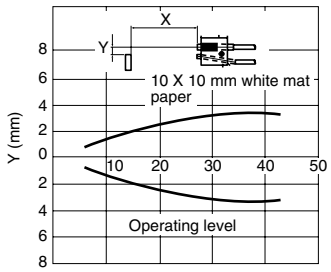


Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-T4**
Side viewer: **PX3-F02**



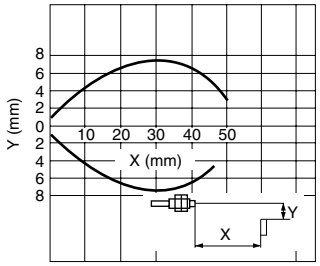
● Operating range

Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-T3**
Spot viewer: **PX3-F03**

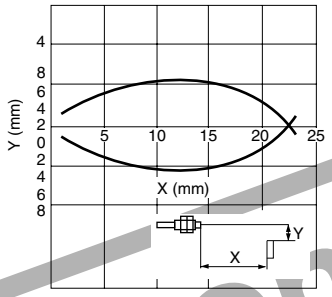


● Operating range

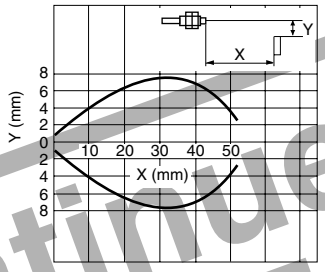
Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-D6, D6S**



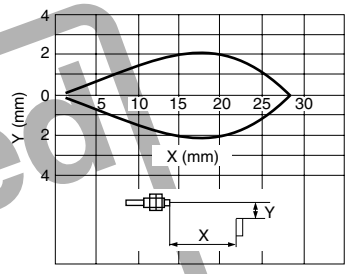
Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-DB3, DB3S**



Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-DA6**

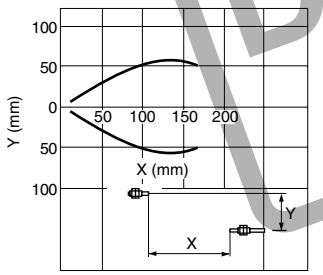


Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-DC6, DC6S**

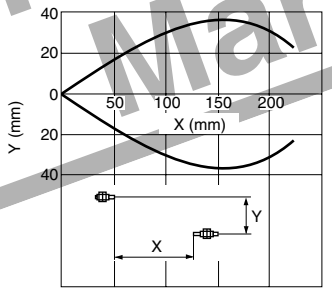


● Setting range of light source and receiver head

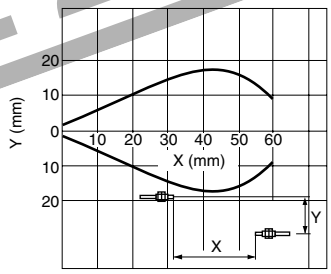
Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-T4, T3, T4S**



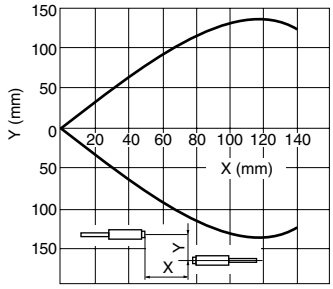
Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-TC4, TC4S**



Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-TB3, TB3S**

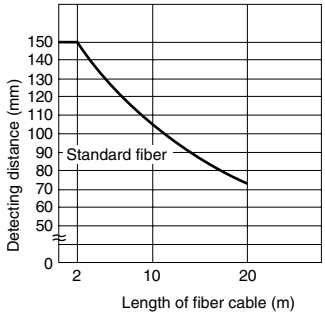


Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-T4**
Lens: **PX3-F01**

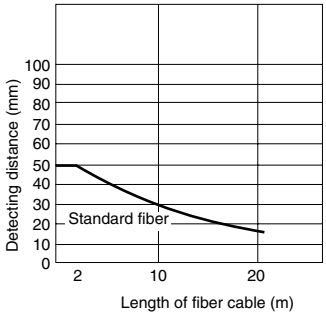


● Length of fiber cable–Detecting distance

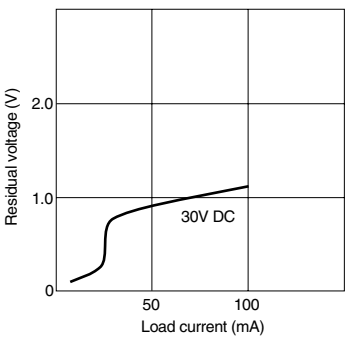
Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-T4**



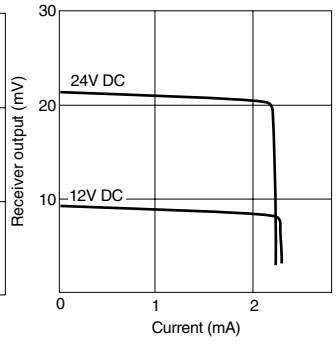
Amplifier: **PH21A-PRN, PRND**
Fiber: **PH2F-D6**



● Residual voltage



● Voltage output

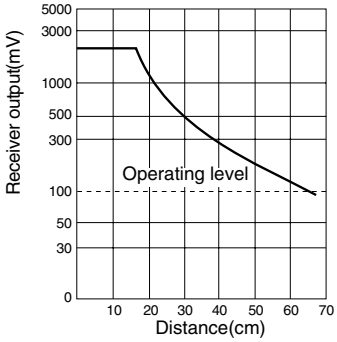


Discontinued Mar. 2007

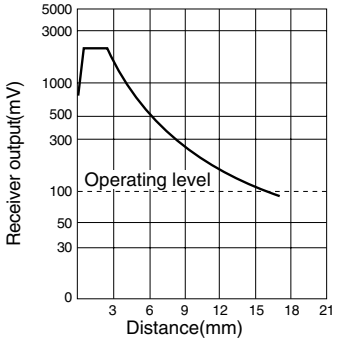
■ Typical characteristic data/PH21A-PGN, PGND

● Receiver output–Distance

Amplifier: **PH21A-PGN, PGND**
Fiber: **PH2F-T4**

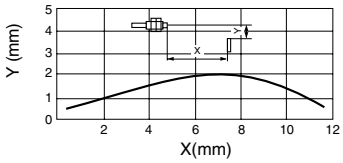


Amplifier: **PH21A-PGN, PGND**
Fiber: **PH2F-D6**



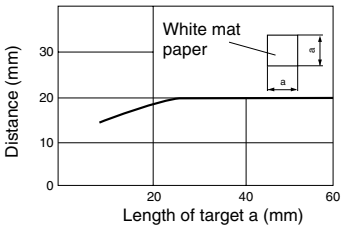
● Operating range

Amplifier: **PH21A-PGN, PGND**
Fiber: **PH2F-D6**



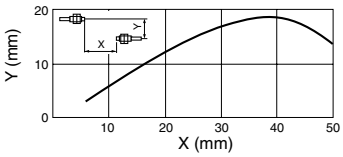
● Detecting distance– Size of target

Amplifier: **PH21A-PGN, PGND**
Fiber: **PH2F-D6**



● Setting range of light source and receiver head

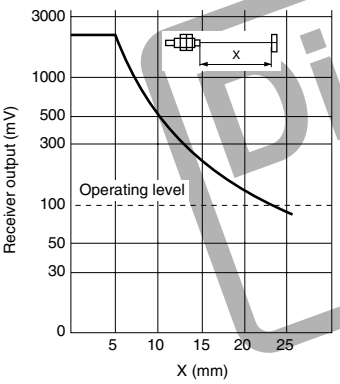
Amplifier: **PH21A-PGN, PGND**
Fiber: **PH2F-T3, T4, T4S**



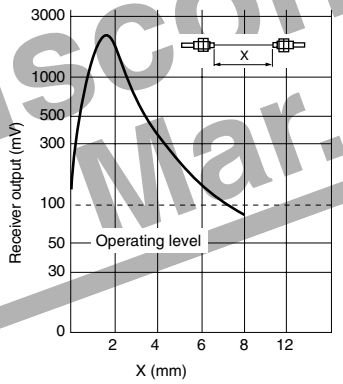
■ Typical characteristic data/PH21A-PIN, PIND

● Receiver output–Distance

Amplifier: **PH21A-PIN, PIND**
Fiber: **PH2F-T4**

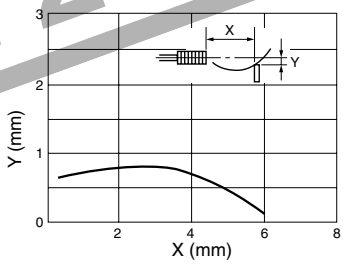


Amplifier: **PH21A-PIN, PIND**
Fiber: **PH2F-D6**



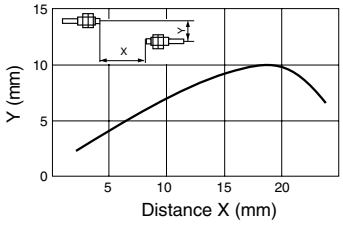
● Operating range

Amplifier: **PH21A-PIN, PIND**
Fiber: **PH2F-D6, D6S**



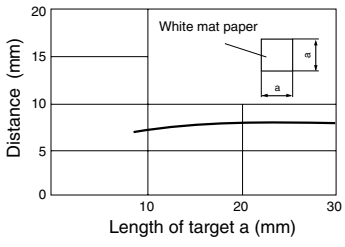
● Setting range of light source and receiver head

Amplifier: **PH21A-PIN, PIND**
Fiber: **PH2F-T3, T4, T4S**

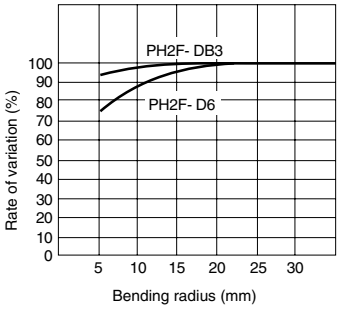


● Detecting distance– Size of target

Amplifier: **PH21A-PIN, PIND**
Fiber: **PH2F-D6**



● Bending radius– Receiver output



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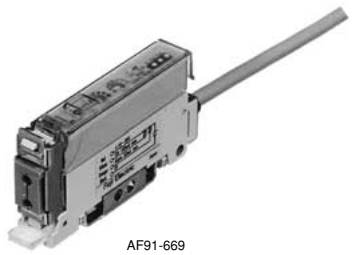
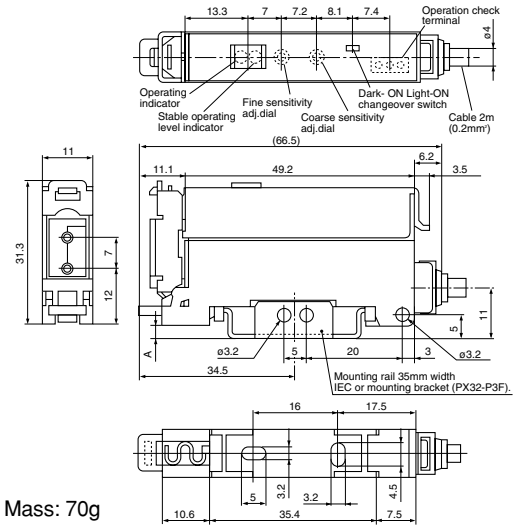
■ Dimensions, mm

● Amplifier unit

PH21A-PRN, PRND
PH21A-PGN, PGND
PH21A-PIN, PIND



AF91-669



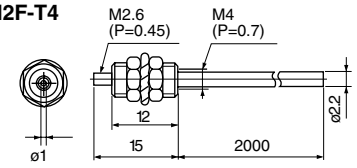
Mass: 70g

Mounting rails and bracket

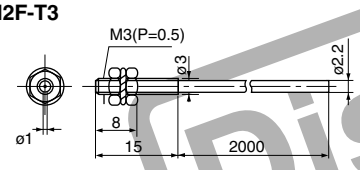
A	Rail or bracket	Type	Ordering code
3.5	Rail	**TH35-7.5**	RR7F
3.5	Rail	**TH35-7.5AL**	RR7A
11	Rail	**TH35-15A**	RR15A
2	Bracket	**PX32-P3F**	

● Fiber unit/transmission type

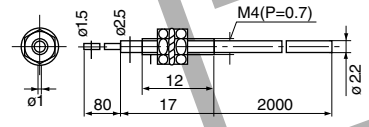
PH2F-T4



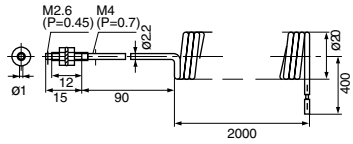
PH2F-T3



PH2F-T4S



PH2F-TC4



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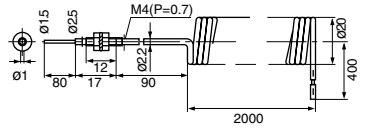
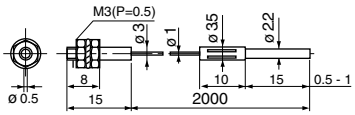
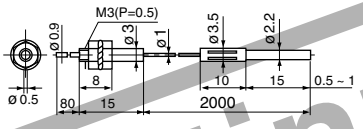


PH2F-TB3

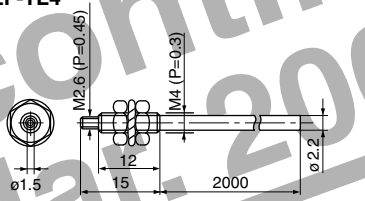


● Fiber unit/transmission type

PH2F-TB3S

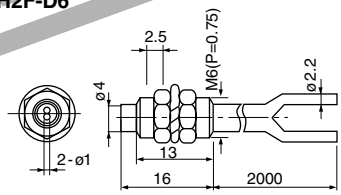


PH2F-TL4

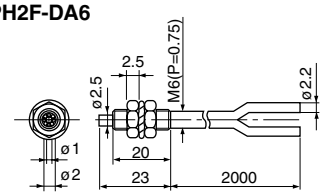


● Fiber unit/transmission type

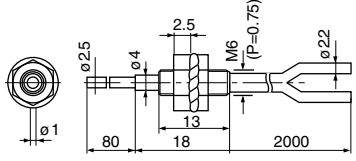
PH2F-D6



PH2F-DA6

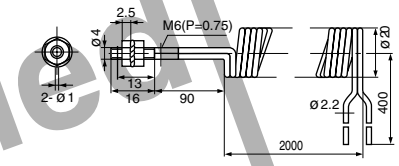


PH2F-D6S

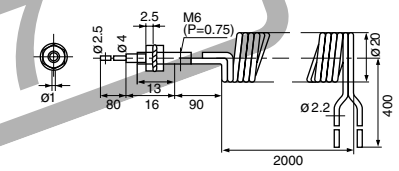


● Fiber unit/diffuse reflection type

PH2F-DC6

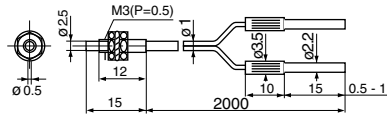


PH2F-DC6S



● Fiber unit/diffuse reflection type

PH2F-DB3



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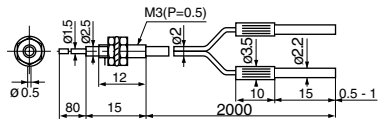
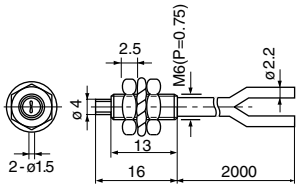


PH2F-DL6



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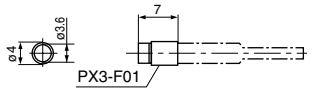
■ Dimensions, mm

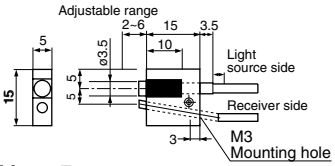
● Accessories

Lens PX3-F01



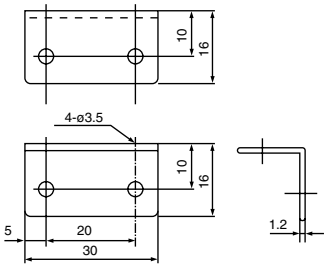
Mass: 2g

Spot viewer PX3-F03

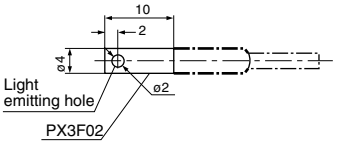


Mass: 7g

Mounting bracket PX32-P3F (supplied with amplifier unit)

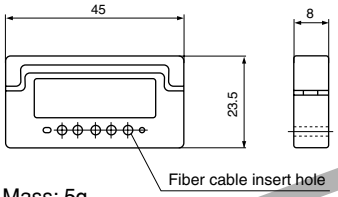


Side viewer PX3-F02



Mass: 2g

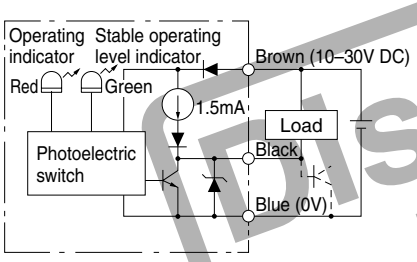
Plastic fiber cable cutter (supplied with fiber unit) PX3-Z1



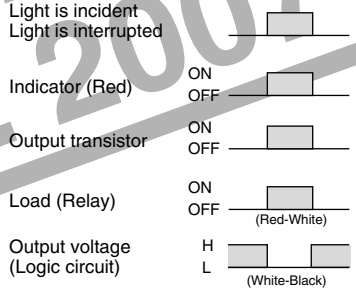
Mass: 5g

■ Wiring and timing diagrams

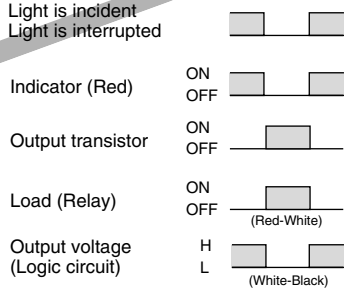
PH21A-PRN, PGN, PIN



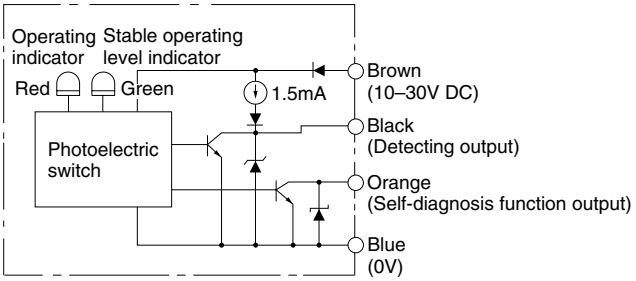
● "Light-ON" mode
Transistor ON when light is incident. Set changeover switch to L-on side.



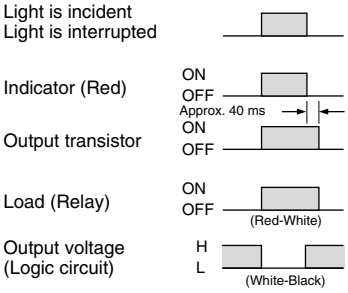
● "Dark-ON" mode
Transistor ON when light is interrupted. Set changeover switch to D-on side.



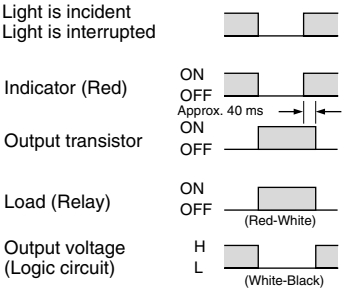
PH21A-PRND, PGND, PIND



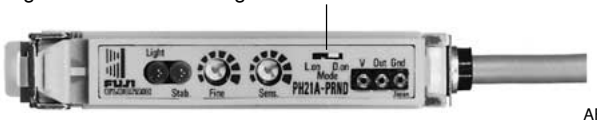
● "Light-ON" mode
Transistor ON when light is incident. Set changeover switch to L-on side.



● "Dark-ON" mode
Transistor ON when light is interrupted. Set changeover switch to D-on side.



Light-ON/Dark-ON changeover switch



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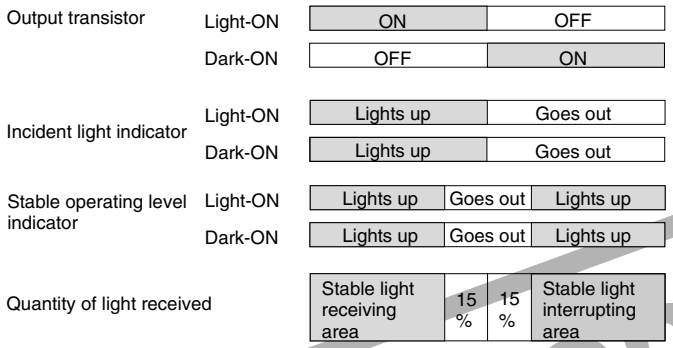
■ Indication lamps

● Incident light indicator (red "Light" lamp)
Lights upon exposure to incident light in either the Light-ON or Dark-ON operating mode.

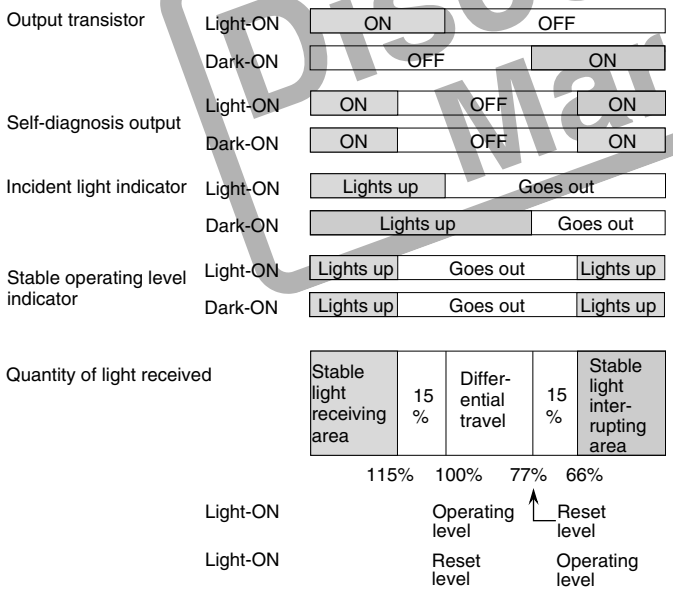
● Stable operating level indicator (green "Stab" lamp)
Indicates that the amount of light or shade for detection by the light source is at a stable and suitable level for operation. This lamp lights when the amount of light or shade detected by the element is no less than 1.15 times the operating level.

● Relationship between quantity of light received, output and indication lamp

PH21A-PRN, -PGN, -PIN



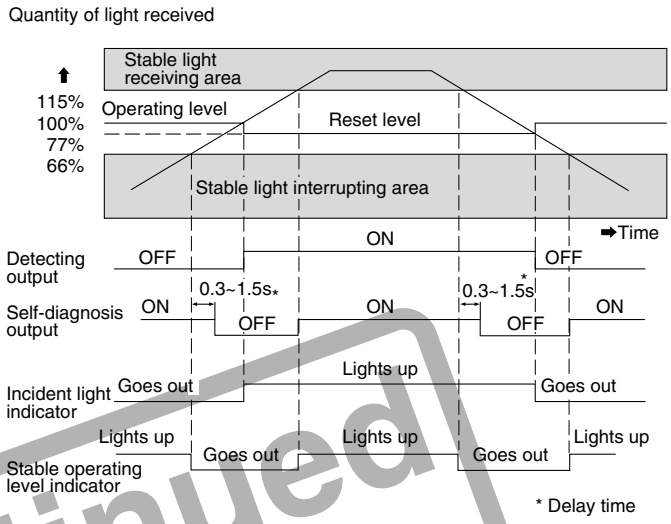
PH21A-PRND, -PGND, -PIND



■ Time chart of the self-diagnosis function

The self-diagnosis output is OFF when the quantity of light received has reached the range from 66 to 115% of the operating level due to the deflection of the optical axis or buildup of dirt and this situation has continued over delay time.

Self-diagnosis function timing diagram (Light-ON)



■ Optical axis adjustment

● Transmission type
- Position the tips of the optical fibers so that they face each other and encompass the sensing position.
- The incident light indicator lights (red) when the optical axes are aligned. Check also that the stable operating level indicator (green) lights.

● Diffuse reflection type
- Visually align the sensor positions.
- The characteristics of detection depend on the material and shape of the target object.
- Upon detection of the target object, the incident light indicator lights (red). Check also that the stable operating level indicator (green) lights.

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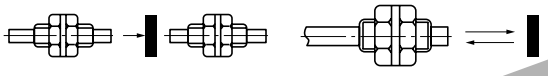
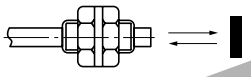
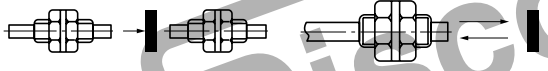
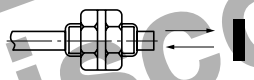
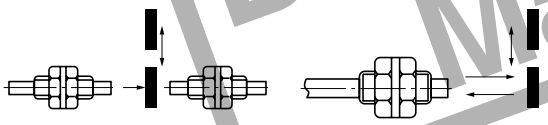
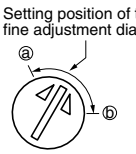
■ Procedure of sensitivity adjustment

- When carrying out a normal detection, set both dials at the maximum sensitivity value by turning them fully clockwise.
- When a photoelectric switch is used for detection of an object with inadequate contrast, sensitivity adjustment should be carried out.

Carry out the sensitivity adjustment as follows.

State of detected object			Coarse adjustment dial	Fine adjustment dial
Transmission type	Diffuse reflection type			
		1. Set the fine adjustment dial at the central position.		
		2. Set the coarse adjustment dial at approximate operating position.		
		3. Obtain the operating position at the time of presence or absence of the object to be detected by means of the fine adjustment dial, and set at the middle position.		

Discontinued Mar. 2007

AF90-247

Coarse adjustment dial

Fine adjustment dial

Photoelectric switches with built-in amplifier PH1C

XX03-014A,15A

Transmission type
PH1CT

XX03-013A

Retroreflective type
PH1CR

Diffuse reflection type
PH1CD

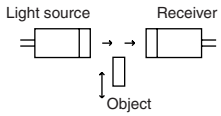
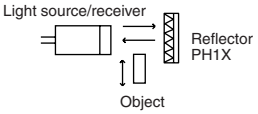
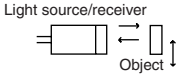
XX03-007A

Reflector
PH1X

■ Features

- Highly compact with dimensions of 10.8 x 31 x 20mm
- Energy-saving design
- Covers a wide range of detection with distances of 10m (transmission type), 3 or 4m (retroreflective type), or 1m (diffuse reflection type)
- Retroreflective type equipped with mirror surface rejection function
- High-speed response time of 1ms
- Light-ON/Dark-ON selectable with operation mode switch
- Equipped with various protective functions
- High degree of protection of IP67 (IEC) enables use even in environments where exposure to water is possible.
- Improved alignment (±2.5˚) of optical and mechanical axes simplifies adjustment (transmission type, retroreflective type)
- Environment-friendly lead-free solder used
- Meets CE Mark requirements.

■ Types

Detecting method	Detecting distance	Light emitting element	Output	Output operation mode	Type	Supplied item	Cable length
Transmission type  	10m	Red LED	NPN transistor, open collector output	Dark-ON / Light-ON selectable	**PH1CT-M1DC**	Light source and receiver	2m
					PH1CT-M1DCSN		5m
					PH1CT-M1DCST		10m
					PH1CT-M1DCR	Receiver	2m
					PH1CT-M1DCRLN		5m
					PH1CT-M1DCT	Light source	2m
					PH1CT-M1DCTLN		5m
Retroreflective type (with mirror surface rejection)  	0.1 to 3m (using PH1X-R1) 0.1 to 4m (using PH1X-R1S)	Red LED			**PH1CR-3MDC**	Light source/ receiver	2m
					PH1CR-3MDCLN		5m
Diffuse reflection type  	1m	Infrared LED			**PH1CD-1MDC**	Light source/ receiver	2m
					PH1CD-1MDCLL		3m

■ Ratings and specifications

Detection method		Transmission type	Retroreflective type (with mirror surface rejection)	Diffuse reflection type
Type		**PH1CT-M1DC**	**PH1CR-3MDC**	**PH1CD-1MDC**
Light emitting element		Red LED		Infrared LED
Supply voltage		12 to 24V DC ±10% (ripple ±10% or less)		
Current consumption		Light source: 15mA, Receiver: 20mA	30mA max.	
Detecting distance		10m	0.1 to 3m (using PH1X-R1) 0.1 to 4m (using PH1X-R1S)	1m (white mat paper 30 x 30cm)
Detectable target		Opaque 12mm dia. min.	Opaque 75mm dia. min.	Transparent or opaque
Directional angle		Light source and receiver: 3 to 15° each	Light source/receiver: 2 to 10°, Reflector: 30°	–
Differential		–		Max. 20% of detecting distance
Detecting output		NPN transistor, open collector output Load current: 100mA max. (26.4V DC) Residual voltage: 1V DC max. at load current less than 10mA 2V DC max. at load current of 10 to 100mA		
Output operation mode		Dark-ON / Light-ON selectable		
Response time		1ms max. (operation/reset)		
Indicator	Operation indicator	Orange LED (Light source: power supply indicator)	Orange LED	Orange LED
	Stability level indicator	Green LED (Receiver)	Green LED	Green LED
Connection		Attached cable (2m, 0.2mm^2)		
Sensitivity adjustment		Dial		
Ambient operating illumination		Incandescent lamp: 3000 lx max. (at receiving surface) Sunlight: 10000 lx max. (at receiving surface)		
Ambient temperature		Operating: –25 to +55˚C (no icing), storage: –40 to +70˚C		
Ambient humidity		Operating: 35 to 85%RH (no condensation), storage: 35 to 95%RH		
Degree of protection		IP67 (IEC)		
Protective function		Reverse polarity (input), short-circuit and reverse polarity (output)	Reverse polarity (input), short-circuit, reverse polarity (output) and mutual interference	
Insulation resistance		20MΩ (500V DC megger)		
Dielectric strength		1,000V AC for 1min		
Vibration		10 to 55Hz, 1.5mm double amplitude or 300m/s^2 (2 hours for each X, Y, Z direction)		
Shock		500m/s^2 (3 times for each X, Y, Z direction)		
Material	Casing	Polybutylene terephthalate resin (PBT)		
	Lens	Polyarylate resin (PAR)	Methacrylic resin (PMMA)	Polyarylate resin (PAR)
Mass		Approx. 120g	Approx. 65g	Approx. 65g
Accessory (option)		Mounting bracket (PH1X-P1, PH1X-P2)		

Note : Reflectors PH1X-R1 and R1S (for retroreflective type PH1CR use) are sold separately.

■ Type number nomenclature

PH 1C T-M1 D C □ □

Basic type
PH : Photoelectric switch

Series
1C : With built-in amplifier

Detecting method
T : Transmission type
R : Retroreflective type
D : Diffuse reflection type

Detecting distance
1M : 1m
3M : 3m
M1 : 10m

Output
D : NPN transistor, open collector output

Output operatoin mode
C : Dark-ON, Light-ON selectable

Supplied item
Blank : Light source and receiver, (PH1CR, PH1CD)
T : Light source
R : Receiver

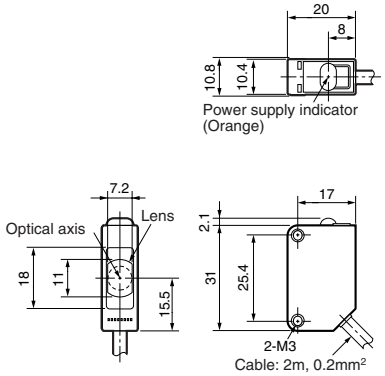
Cable length
Blank : 2m
LL : 3m
LN : 5m
SN : 5m (PH1CT-M1DC)
ST : 10m (PH1CT-M1DC)

● **Ordering information**
Specify the following
1. Type number

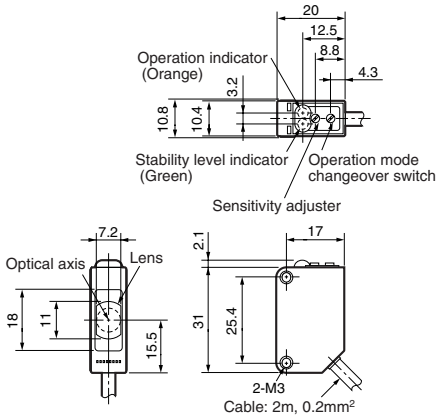
■ Dimensions, mm

● PH1CT-M1DC

Light source

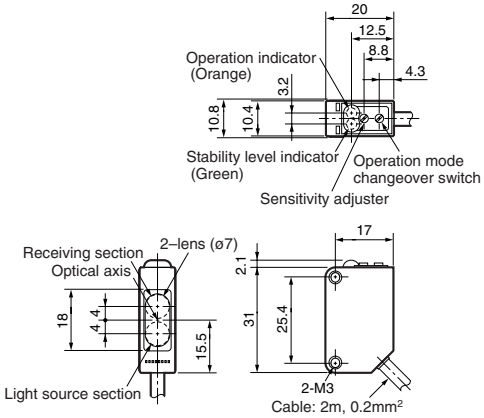


Receiver



● PH1CR-3MDC, PH1CD-1MDC

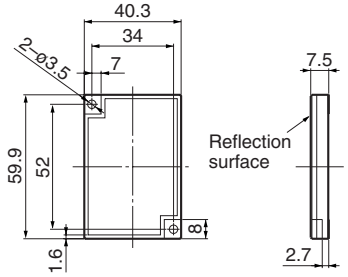
Light source/receiver



■ Dimensions, mm (sold separately)

● Reflector

PH1X-R1, PH1X-R1S

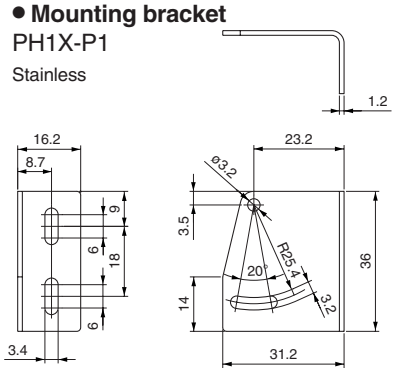


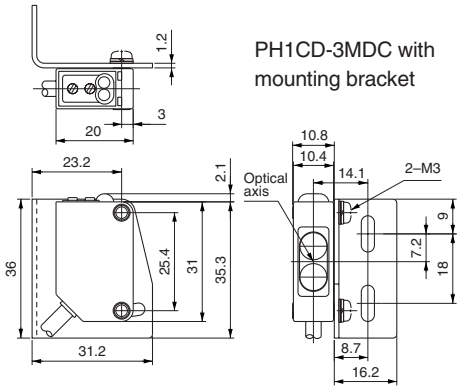
Reflection surface: Methacrylic resin (PMMA)
Reverse side: Acrylonitrile butadiene styrene resin (ABS)

● Mounting bracket

PH1X-P1

Stainless

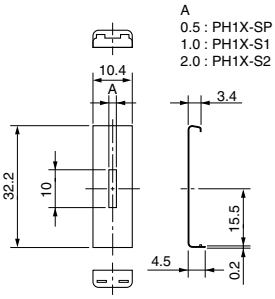




● Slit

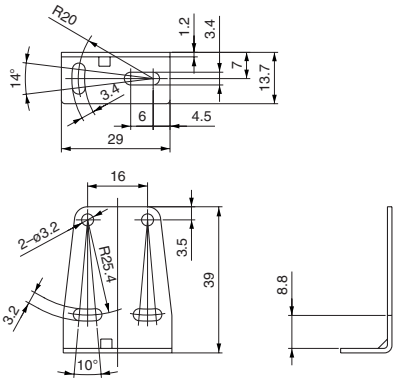
PH1X-SP, PH1X-S1, PH1X-S2

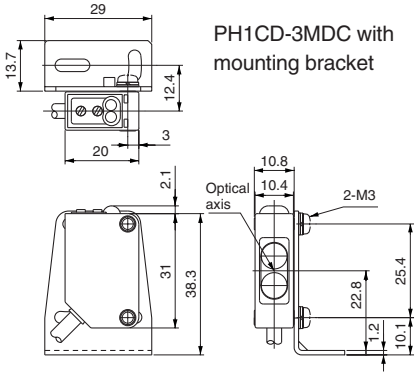
Stainless



PH1X-P2

Stainless





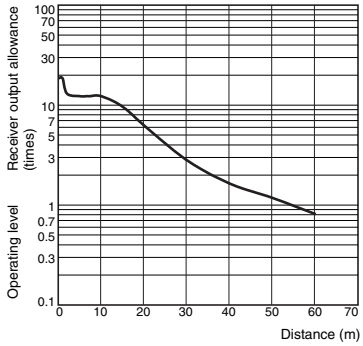
● Detection characteristics using PH1X slit

Photoelective switch	PH1CT-M1DC		
Slit width (mm)	0.5×10	1×10	2×10
Detecting distance (m)	0.7	1.5	3.5
Minimum detectable target (mm dia.)	0.2	0.5	0.8

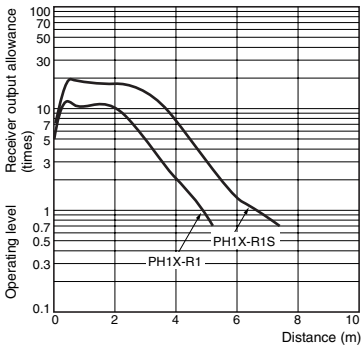
■ Characteristic curve, typical

● Receiver output-Distance

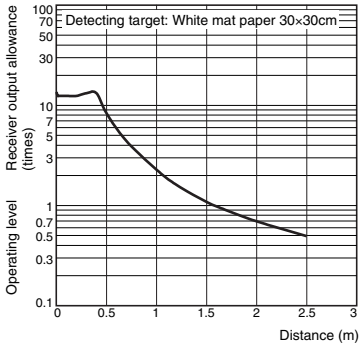
PH1CT-M1DC



PH1CR-3MDC + Reflector

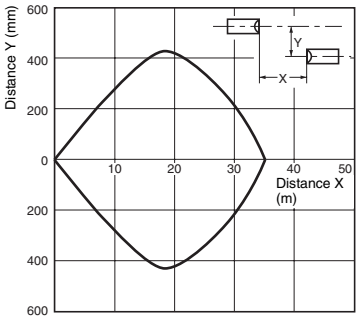


PH1CD-1MDC

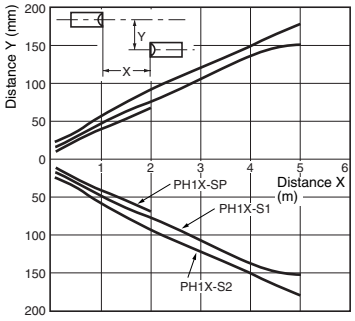


● Setting range of light source and receiver head

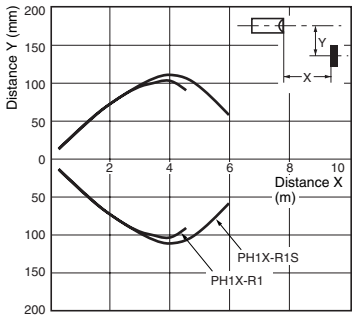
PH1CT-M1DC



PH1CT-M1DC + Slit

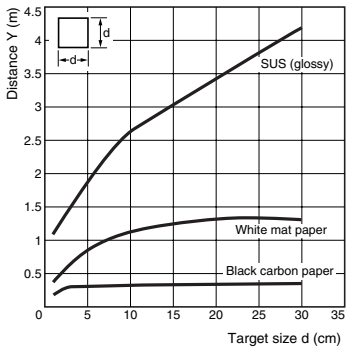


PH1CR-3MDC + Reflector



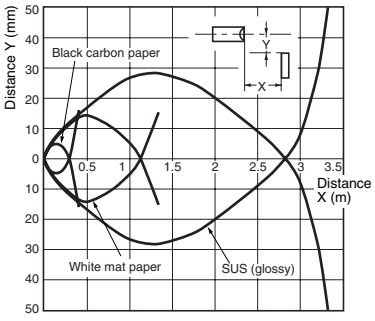
● Size of detecting target - Distance

PH1CD-1MDC



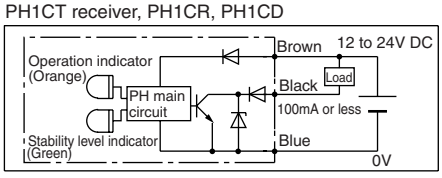
● Operating range

PH1CD-1MDC

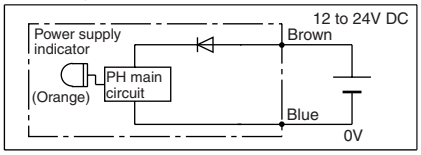


■ Wiring diagrams

PH1CT receiver, PH1CR, PH1CD

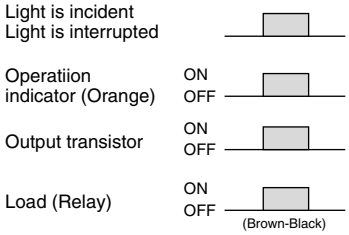


PH1CT light source

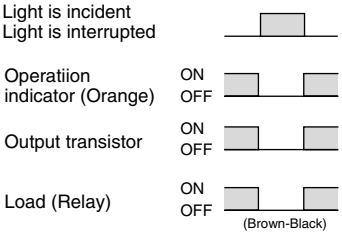


■ Timing diagrams

● "Light-ON" mode (switch: L side)



● "Dark-ON" mode (switch: D side)



■ Indicator

● Operation indicator (Ope)

Lights when the switch is activated (output transistor ON) irrespective of Light-ON, Dark-ON.

● Stability level indicator (Stab)

Lights when the incident light or shaded light is good enough for stable level.

Status of incident light		Indicator	**Stab** (green)	**Ope** (orange)	Allowance
Light-ON	Dark-ON				
Stable incident	Stable shade		ON	ON	Operation level ×1.11
Unstable incident	Unstable shade		OFF	ON	Operation level
Unstable shade	Unstable incident		OFF	OFF	Operation level ×0.86
Stable shade	Stable incident		ON	OFF	

■ Optical axis adjustment

● Transmission type

Swinging the light source and receiver up and down and right and left when no objects exist, set and fix the light source and receiver to the center within the range where the operation indicator (orange) is lit or is turned off (Dark-ON). At the same time make sure that the stability level indicator (green) is lit.

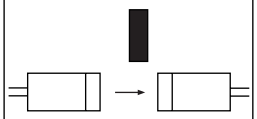
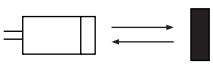
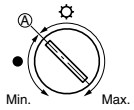
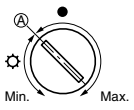
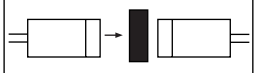
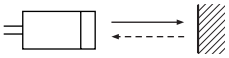
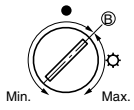
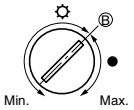
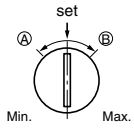
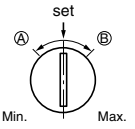
● Retroreflective type

Swinging the unit and reflector up and down and right and left when no objects exist, set and fix the unit and reflector to the center within the range where the operation indicator (orange) is lit or is turned off (Dark-ON). At the same time make sure that the stability level indicator (green) is lit.

05

■ Sensitivity adjustment

- When carrying a normal detection, set the sensitivity adjuster at the maximum sensitivity value by turning it fully clockwise.
- Sensitivity adjustment is necessary for the following cases.
  - Transmission type: To detect translucent or minute objects
  - Reflection type: To detect objects with inadequate contrast
- Carry out the sensitivity adjustment as follows. (When excessive power is added to the sensitivity adjuster, it might be damaged.)

Step	State of detected object		Operation indicator and sensitivity adjuster		Step
	Transmission type	Reflection type	Light-ON	Dark-ON	
1		Detected object 			By turning the sensitivity adjuster, obtain point A and B at that the status of the operation indicator changes. Unless the status changed, two points at finishing turning the sensitivity adjuster will be point A or B.
2		Background object 			
3	—	—			An intermediate position between point A and B will be the optimum position.

Note: ☼ lit, ● not lit

Photoelectric switches with AC/DC input PH4C

■ Features

- Highly compact with dimensions of 18 x 50 x 50mm
- Accepts a wide range of supply voltage with AC/DC dual input
- Retroreflective type has a wider range of detecting distance. 3.5m for PH4CR-2HR□, 5m for PH4CR-4MR□ (using a separately-sold reflector PH1X-R1S)
- Retroreflective type equipped with mirror surface rejection function
- Meets CE Mark requirements

XX03-003A

Transmission type
PH4CT

XX03-002A

Retroreflective type
PH4CR

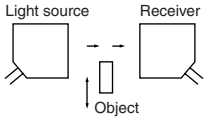
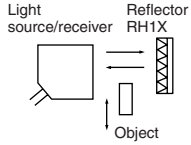
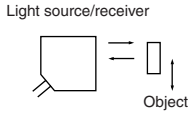
XX03-001A

Diffuse reflection type
PH4CD

XX03-007A

Reflector
PH1X-R1S

■ Types

Detecting method		Detecting distance	Light emitting element	Output	Operation mode	Type	Supplied item	Cable length
Transmission type 		5m	Infrared LED	Relay output (SPDT)	Light-ON	**PH4CT-5MRA**	Light source and receiver	2m
						PH4CT-5MRAR	Receiver	2m
					–	**PH4CT-5MRT**	Light source	2m
					Dark-ON	**PH4CT-5MRB**	Light source and receiver	2m
						PH4CT-5MRBR	Receiver	2m
Retroreflective type 	Without mirror surface rejection	0.1 to 4m (0.1 to 5m)*	Red LED		Light-ON	**PH4CR-4MRA**	Light source/ receiver	2m
					Dark-ON	**PH4CR-4MRB**		
	With mirror surface rejection	0.1 to 2.5m (0.1 to 3.5m)*			Light-ON	**PH4CR-2HRA**	Light source/ receiver	2m
					Dark-ON	**PH4CR-2HRB**		
Diffuse reflection type 		30cm	Infrared LED		Light-ON	**PH4CD-3CRA**	Light source/ receiver	2m
					Dark-ON	**PH4CD-3CRB**		

Note: * The distances in ( ) are the values where a separately-sold reflector PH1X-R1S is used.

■ Ratings and specifications

Detection method		Transmission type	Retroreflective type		Diffuse reflection type
			Without mirror surface rejection	With mirror surface rejection	
Type	Light-ON	**PH4CT-5MRA**	**PH4CR-4MRA**	**PH4CR-2HRA**	**PH4CD-3CRA**
	Dark-ON	**PH4CT-5MRB**	**PH4CR-4MRB**	**PH4CR-2HRB**	**PH4CD-3CRB**
Light emitting element		Infrared LED	Red LED		Infrared LED
Supply voltage		24 to 240V AC ±10% 50/60Hz, 12 to 240V DC ±10% (ripple ±10% or less)			
Current consumption		3W max.	2W max.		
Detecting distance		5m	0.1 to 4m (using PH1X-R1) * 0.1 to 5m (using PH1X-R1S) *	0.1 to 2.5m (usingPH1X-R1) * 0.1 to 3.5m (using PH1X-R1S) *	30cm (white mat paper 10x10cm)
Detectable target		Opaque 14.8mm dia. min.	Opaque 75mm dia. min.		Transparent or opaque
Directional angle		Light source and receiver: 3 to 20˚ each	Light source/receiver: 1 to 5˚, Reflector: 40˚		–
Differential		–			Max. 20% of detecting distance
Detecting output		Contact output: 250V AC 3A (cos ø =1), 5V DC 10mA			
Relay durability	Mechanical	50 millions operations (at 18,000 operations/hour)			
	Electrical	100,000 operations (at 1,800 operations/hour)			
Response time		30ms max. (operation/reset)			
Indicator		Red LED (on when light is incident) Power supply indicator for light source			
Connection		Attached cable (2m, 0.3mm²)			
Sensitivity adjustment		–			Dial type
Ambient operating illumination		Incandescent lamp: 3,000 lx max. (at receiving surface)			
Ambient temperature		Operating: –25 to +55˚C (no icing), storage: –30 to +70˚C			
Ambient humidity		Operating: 45 to 85%RH (no condensation), storage: 35 to 95%RH			
Degree of protection		IP64 (IEC)			
Insulation resistance		20MΩ (500V DC megger)			
Dielectric strength		1,500V AC 50/60Hz for 1min			
Vibration		10 to 55Hz, 1.5mm double amplitude (2 hours for each X, Y, Z direction)			
Shock		500m/s² (3 times for each X, Y, Z direction)			
Material	Casing	Acrylonitrile butadiene styrene resin (ABS)			
	Lens	Methacrylic resin (PMMA)			
Mass		Approx. 420g	Approx. 250g		Approx. 250g
Accessory (supplied)		Mounting bracket (PH4X-P1), reflector PH1X-R1 (only for retroreflective type)			

Note: * Reflector PH1X-R1 is supplied, PH1X-R1S is sold separately.

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■ Type number nomenclature

PH 4C T-5M R A □

Basic type
PH : Photoelectric switch

Series
4C : with AC/DC supply voltage

Detecting method
T : Transmission type
R : Retroreflective type
D : Diffuse reflection type

Detecting distance
3C : 30cm
2H : 2.5m
4M : 4m
5M : 5m

Output
R : Relay output

Operatoin mode
A : Light-ON
B : Dark-ON

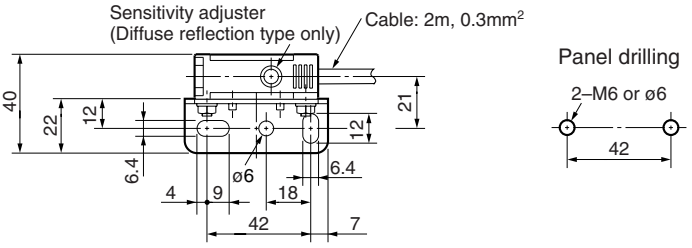
Supplied item
Blank : Light source and receiver, (PH4CR, PH4CD)
T : Light source
R : Receiver

● Ordering information

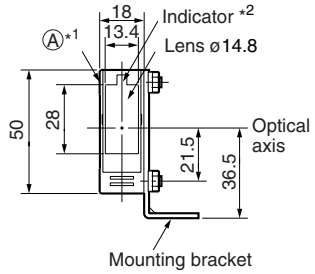
Specify the following
1. Type number

■ Dimensions, mm

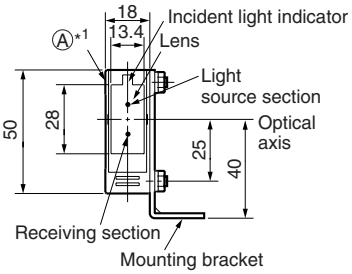
● PH4CT, PH4CR, PH4CD

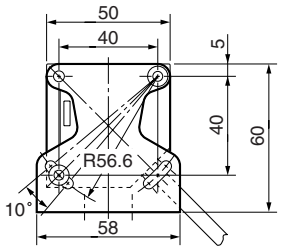


PH4CT



PH4CR, PH4CD

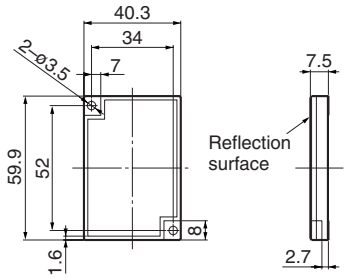




*1 Mounting bracket can be fit on the side "A" too.
*2 Power supply indicator for light source, incident light indicator for receiver

● Reflector for PH4CR

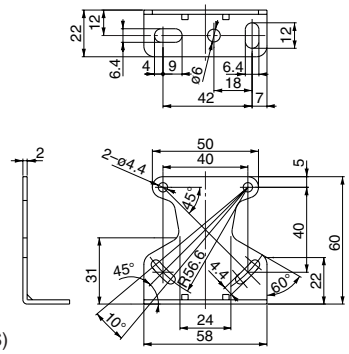
PH1X-R1 (supplied)
PH1X-R1S (optional)



Reflection surface: Methacrylic resin (PMMA)
Reverse side: Acrylonitrile butadiene styrene resin (ABS)

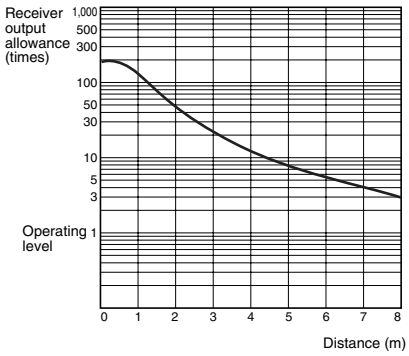
● Mounting bracket

PH4X-P1

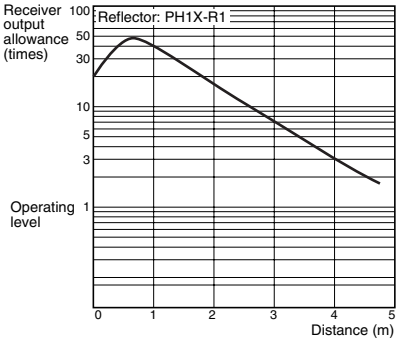


■ Characteristic curve, typical

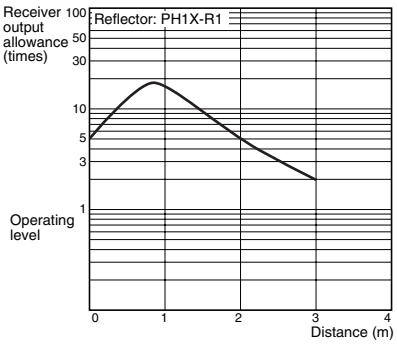
Receiver output - Distance
PH4CT-5MR



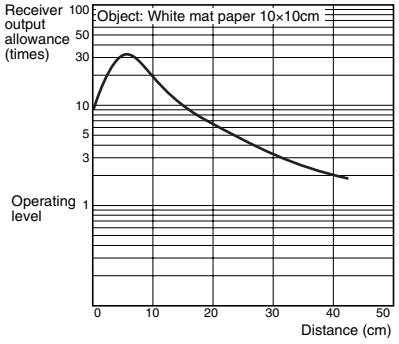
PH4CR-4MR + PH1X-R1 (supplied)



PH4CR-2HR + PH1X-R1 (supplied)



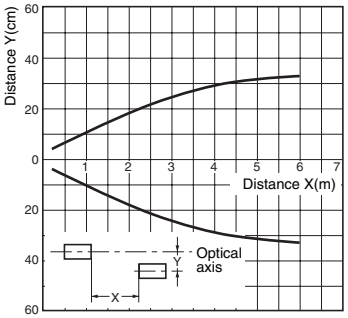
PH4CD-3CR



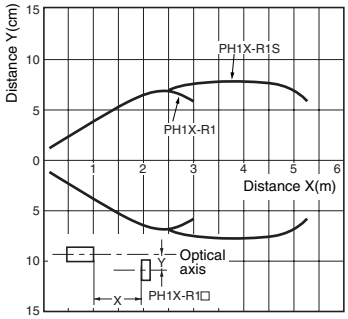
■ Characteristic curve, typical

● Setting range of light source and receiver head

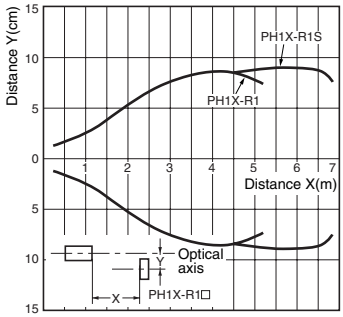
PH4CT-5MR



PH4CR-2HR + Reflector

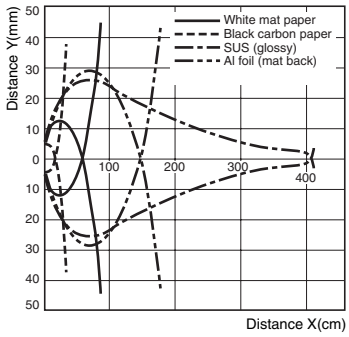


PH4CR-4MR + Reflector



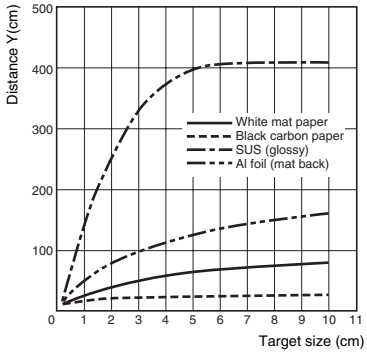
● Operating range

PH4CD-3CR



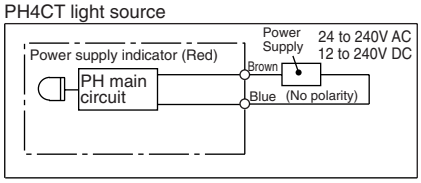
● Size of detecting target - Distance

PH4CD-3CR

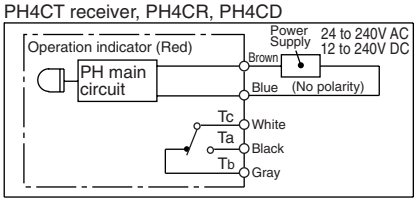


■ Wiring diagrams

PH4CT light source



PH4CT receiver, PH4CR, PH4CD



■ Timing chart

Type	Timing chart	
PH4CT-5MRA PH4CT-5MRB	Light incident Light shaded	
PH4CR-2HRA PH4CR-2HRB	Incident light indicator	ON OFF
PH4CR-4MRA PH4CR-4MRB	Light-ON (PH4C□-□□RA)	(Ta) ON OFF
PH4CD-3CRA PH4CD-3CRB	Dark-ON (PH4C□-□□RB)	(Ta) ON OFF

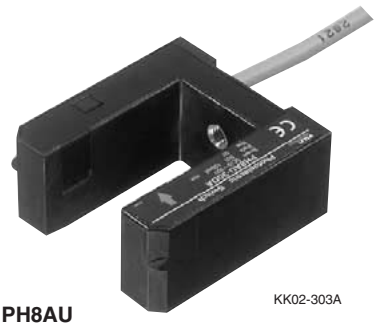
Slot-type photoelectric switches PH8AU

■ Description

Slot-type photoelectric switches ideal for conveyer application, such as elevators and multi-level parking lifts.
The emitter and receiver are constructed as a single unit, eliminating the need to adjust the optical axis or sensitivity.
Same mounting method as our slot-type magnefically operated reed switches (type PM1U).

■ Features

- Protective structure conforms to IP66 (IEC standards), so the product can be used safely in environments with water droplets.
- High speed response time of 1ms.
- Wide supply operating voltage range from 10 to 30V DC.

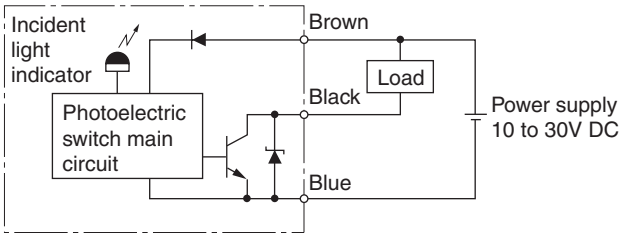


PH8AU

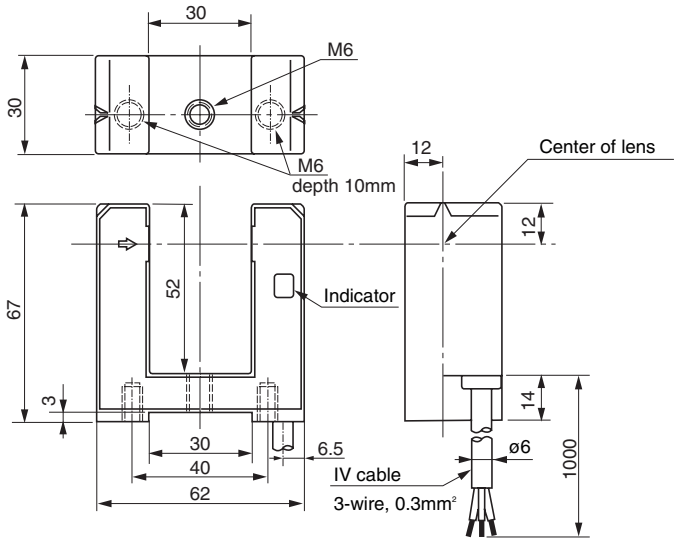
■ Specifications

Type		**PH8AU-30DALF**	**PH8AU-30DBLF**
Operating distance (slot width)		30mm	
Detectable object		Opaque, over 6mm diameter	
Light emitting element		Infrared LED	
Supply voltage		10 to 30V DC (Peak must be within this range)	
Current consumption		45mA or less	
Detecting output		(NPN) transistor open collector output, load current	
		Dark-ON	Light-ON
Response time		1ms or less	
Indicator		Output indicator (Red LED)	
Connection		1m attached cable	
Ambient operating illumination		Incandescent lamp: 3000 lx or less, sun light: 10000 lx or less at receiving surface	
Ambient temperature		Operating: -25 to +55°C Storage: -30 to 70°C (no icing)	
Ambient humidity		Operating: 35 to 85%RH Storage: 35 to 95%RH	
Degree of protection		IP66 (IEC)	
Insulation resistance		20MΩ min. (500V DC Megger)	
Dielectric strength		1000V AC 50/60Hz 1 minute	
Vibration		10 to 55Hz, 1.5mm double amplitude (X, Y, Z direction respectively 2 hours)	
Shock		500m/s^2 three times for each of three directions X, Y and Z	
Protection circuit		Reverse connection and surge voltage	
Material	Lens	PC	
	Casing	PPS	

■ Wiring diagrams



■ Dimensions, mm



Mass 150g

■ Type number nomenclature

PH8A U-30 D A LF

Basic type

Detecting method
U: Slot type

Detecting distance
30: 30mm

Power supply and output
D: DC supply, NPN transistor open collector output

Operation
A: Dark-ON
B: Light-ON

Cable length
LF: 1m

■ Ordering information

Specify the following:
1. Type number (ordering code)

05

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The products identified in this catalog shall be sold pursuant to the terms and conditions identified in the "Conditions of Sale" issued by Fuji Electric FA with each order confirmation.

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⚠ **Caution "Safety precautions"**
- Operate (keep) in the environment specified in the operating instructions and manual. High temperature, high humidity, condensation, dust, corrosive gases, oil, organic solvents, excessive vibration or shock might cause electric shock, fire, erratic operation or failure.
- Follow the regulations of industrial wastes when the product is to be discarded.
- The products covered in this catalogs have not been designed or manufactured for use in equipment or systems which, in the event of failure, can lead to loss of human life.
- If you intend to use the products covered in this catalog for special applications, such as for nuclear energy control, aerospace, medical, or transportation, please consult tour Fuji Electric FA agent.
- Be sure to provide protective measures when using the product covered in these catalogs in equipment which, in the event of failure, may lead to loss of human life or other grave results.
- Follow the directions of the operating instructions when mounting the product.

05 INDIVIDUAL CATALOG

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